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# MOTORSHIP

*Devoted to Marine Oil Engine and Motor Vessels*

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October, 1923
Vol. 8 No. 10

MARINE DIESEL ENGINES
FOR ALL CLASSES OF SHIPS

M. S. STEELMOTOR
Length 250 feet, Breadth 42 feet 9 in.
Draft 16 feet, Displacement 4103 tons
Fitted with 960 I. H. P.
McIntosh & Seymour Diesel Engine.

McINTOSH & SEYMOUR CORPORATION
MAIN OFFICE AND WORKS - AUBURN, N.Y.

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*EXCLUSIVE technical and non-technical articles on design, construction and operation of oil-engines and motorships by the world's foremost writers on marine engineering.*

# MOTORSHIP

*PROFUSELY illustrated with photographic reproductions of the newest designs in international merchant motorship and Diesel-engine construction and auxiliary equipment.*

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Vol. VIII — New York, U. S. A., October, 1923 — No. 10

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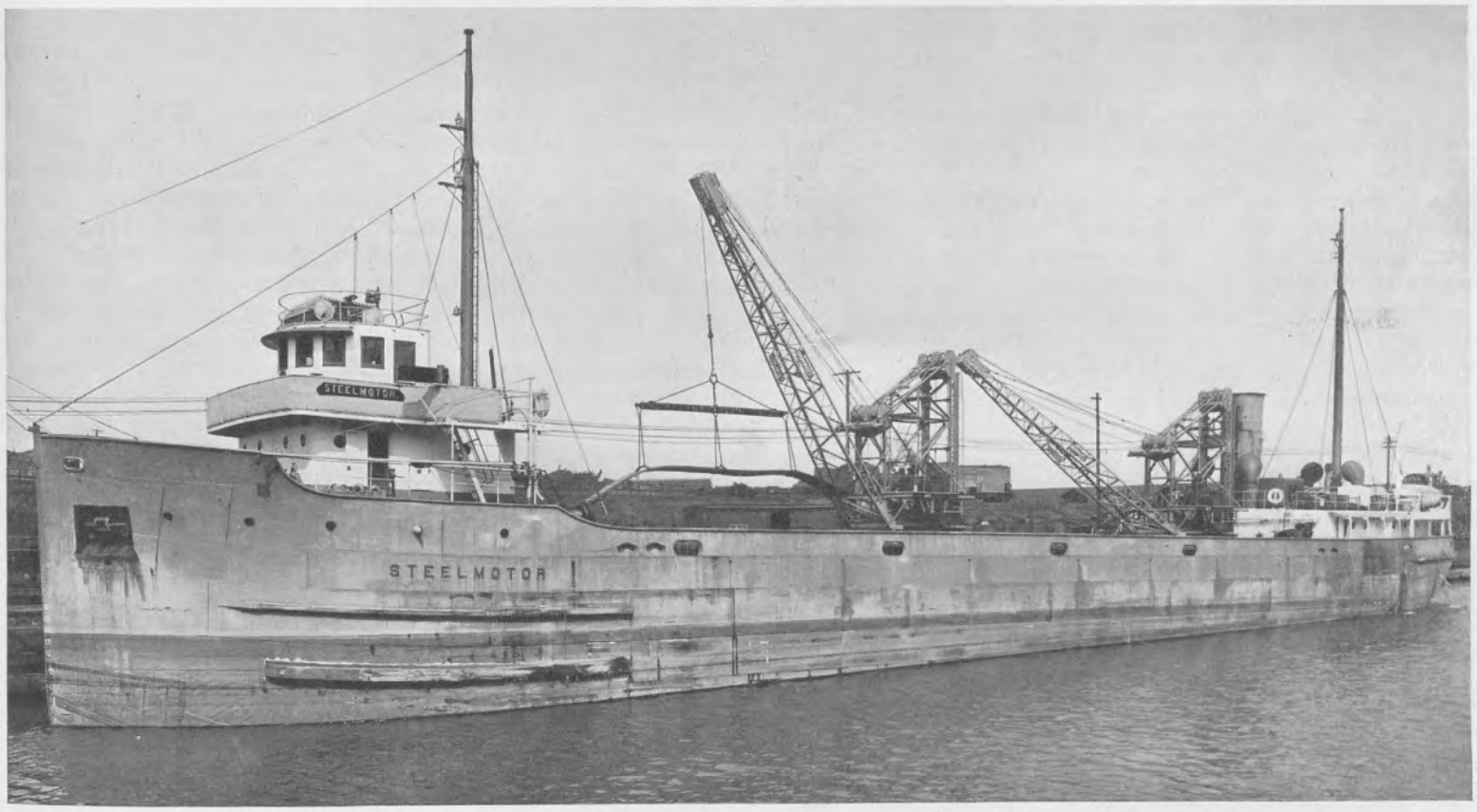
# Ships *Steelmotor* and *Steelvendor* on Lakes

## *Isthmian Steamship Lines Start Chicago-Montreal Freight Service With Two Motor-Vessels*

FOR the first time the United States Steel Corporation interests have become motorship owners and operators—through the addition of the two new Lake type boats STEELMOTOR and STEELVENDOR to the fleet of the Isthmian Steamship Lines. The two new vessels which have been completed this summer, have been built primarily for service on the Great Lakes and St. Lawrence River, but have also been constructed to Class A1E of the American Bureau of Shipping, meeting the requirements of the coastwise trade, in which they will be operated during the winter months.

The big ore and coal carriers of the U. S. Steel Corporation are under the flag of the Pittsburgh Steamship Company, but those vessels never leave the Lakes. The Isthmian Steamship Lines, on the other hand, operate Steel Corporation vessels all over the world.

Both motorships show the influence of Great Lakes ideas on loading and discharging. This gives them a striking appearance, the special cranes installed for rapid handling of cargo through the big hatches being of a type not hitherto seen aboard a vessel. These boats are not for the ore and coal trade, being only of Welland Canal dimensions, but are intended to carry steel mill products and fabricated material, with return cargoes of whatever nature is offered. The two cargo holds are free of all obstructions, there being no pillars, but compensation for the lack of these is made by three deep web beams in each hold, and the hatches are exceptionally large for a vessel of this size, the dimensions being 20 ft. by 40 ft. The Brownhoist cranes are of 5-ton capacity which, in conjunction with the big hatches, will enable standard lengths of rails, plates, girders, etc., and large, heavy fabricated pieces to be handled.




**United States Steel Products Co.'s motorship *Steelmotor* at the dock of the Illinois Steel Company, South Chicago. This picture shows the facility with which the special cranes can handle standard lengths of plates. The *Steelvendor* is a sister vessel**

Built at the yard of the Federal Shipbuilding Co., Kearny, N. J., these two vessels, which are sister ships, have the following principal dimensions:

| | |
|---|---|
| Length overall | 258 ft. 3 in. |
| Length b.p. | 250 ft. 0 in. |
| Breadth moulded | 42 ft. 9 in. |
| Depth moulded to upper deck | 20 ft. 0 in. |
| Load draft—Canal service | 14 ft. 0 in. |
| Load draft—Coastwise service | 16 ft. 0 in. |
| Gross register | 1695 tons. |

They are of the single deck type with raised forecastle, straight stem and elliptical stern. The hulls are built on the transverse system of framing with complete double bottom from peak to peak, utilized for carrying fuel oil and ballast. There are four water-tight bulkheads and the deck is trunked. Of the single-screw type, with machinery aft, each vessel has a McIntosh & Seymour four-cycle Diesel engine direct connected to the propeller shaft. It is designed to develop 750 b.h.p. at 135 r.p.m., which will give the vessel a speed of about 9 knots on a 14 ft. draft. All of the deck machinery is electrically operated, including the steering engine, the two 5-ton revolving cranes, four warping winches and one windlass. As in all Lake vessels, the pilot house is forward, with staterooms for the Captain and owner underneath. The deck crew are housed in the forecastle, and the engine-room crew and steward's departments are quartered in the after deck-house of the upper deck.

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Both main engines were purchased from the Shipping Board, to whom they were delivered by McIntosh & Seymour for vessels that were cancelled soon after the armistice. They are six-cylinder engines, 22 in. by 32 in., rated at 960 i.h.p. and are of the trunk piston type with the cylinders cast separately and mounted on a substantial box frame. There are large openings in the frame opposite each crank, and the webs of the housing form an arch over the bearing caps high enough to give easy access to the caps, but yet retaining in the structure the stiffness and rigidity that are so desirable in an engine of this kind. The design forms an excellent compromise between compactness, strength, lightness and accessibility.

A stiff base carries the engine frame, and on the after end of it is fitted the thrust bearing, which is of the Kingsbury type. The crankshaft is made in two sections, each with three center cranks for the main connecting rods, and an overhung crank is fastened to the forward end for driving the air-compressor, the after end being arranged with a flange, to which the thrust shaft is coupled. All shafts are made to comply with the requirements of the American Bureau of Shipping, Lloyds Register and other classification societies.

The connecting rods are made from steel forgings, carefully heat-treated and flanged at both ends for the fitting of the crank box and wrist-pin box, which are of cast steel lined with a very hard tin base babbitt metal. Laminated liners are provided on rods and boxes to permit adjustment as may be required from time to time.

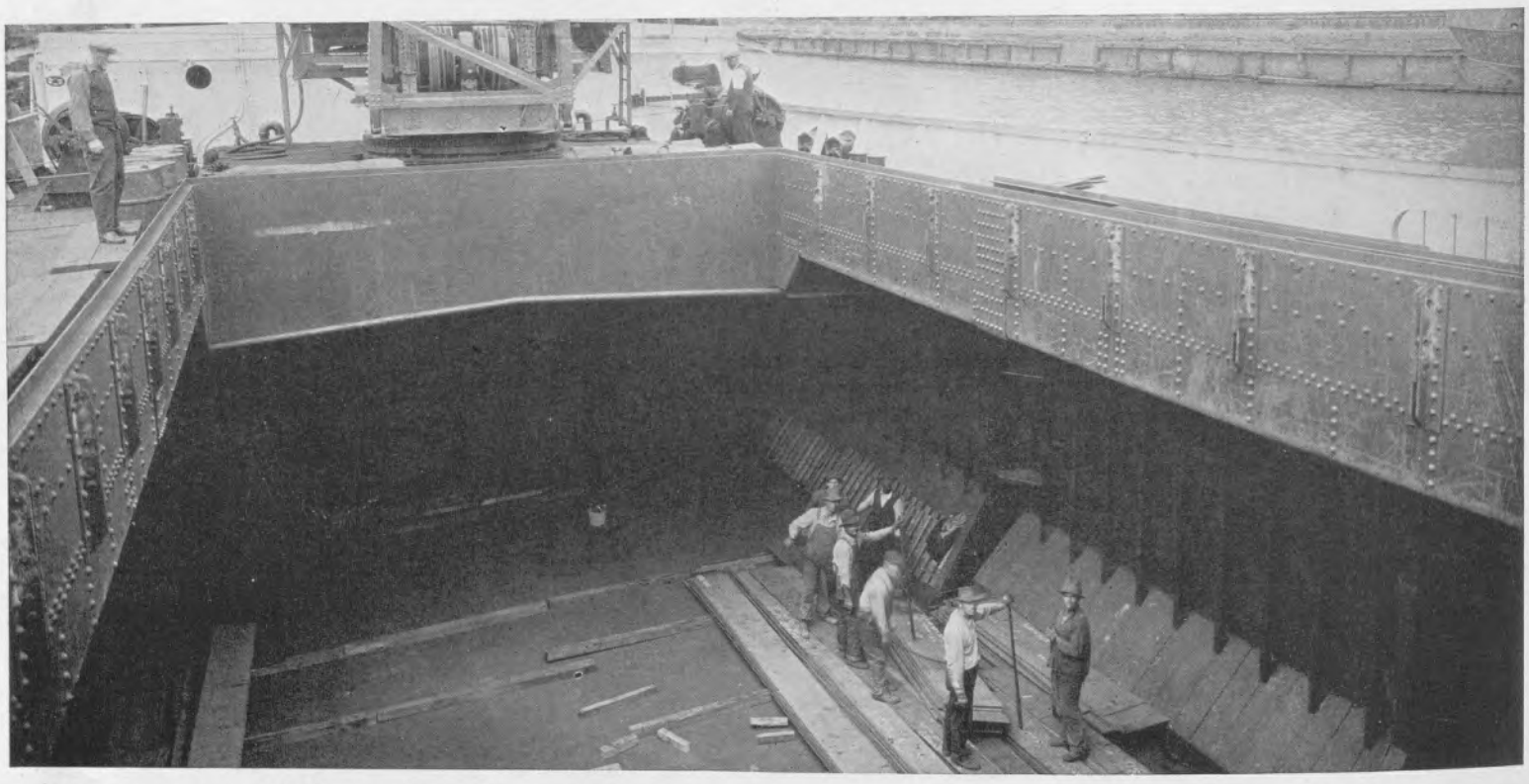
One of the special 5-ton electric cranes installed aboard *Steelmotor* and *Steelvendor*, each ship having two similar cranes

In the McIntosh & Seymour engine the pistons are cast in carefully prepared dry sand from a special mixture of charcoal iron. They are heat-treated before passing into the machine shop where, after machining, they are fitted with the piston pin, the hole for which is bored in a special fixture to ensure that the pin shall be exactly at right angles to the axis of the pistons, and after the pin has been pressed in and the strains set up from this pressing have been relieved, the piston is finished by grinding to the size and shape that have been found to give the best possible service.

Semi-steel is used for the cylinder-heads, which are of deep cylindrical form, giving strength and stiffness with a minimum thickness of metal. The openings for the flow of the cooling water are large and the jacket spaces generously proportioned.

There are four valves to each cylinder, namely the starting-air, suction, fuel and exhaust, all operated by rocker arms and push rods from a camshaft fitted at middle height of the engine. All the valves are in removable cages. On the camshaft there are double sets of cams, providing for ahead and astern running respectively. Parallel with the camshaft is the rocker shaft, which lifts the push rods to permit the axial displacement of the camshaft when the direction of running of the engine is being changed.

All the maneuvering mechanism is operated by compressed air and controlled by a hand lever which is interconnected with the levers controlling the fuel and starting air so that the fuel must be shut off and the starting air rollers be off their cams before the air can enter the maneuvering cylinders. The pistons in these cylinders first roll back the rockers that remove the cam rollers from the cams, then move the camshaft endwise, putting the alternate set of cams under the



Looking through one of the large hatches of the motorship *Steelmotor* gives one the same impression of clear unobstructed hold space as in the big ore-carrying vessels of the Great Lakes. This feature assists a quick turn round

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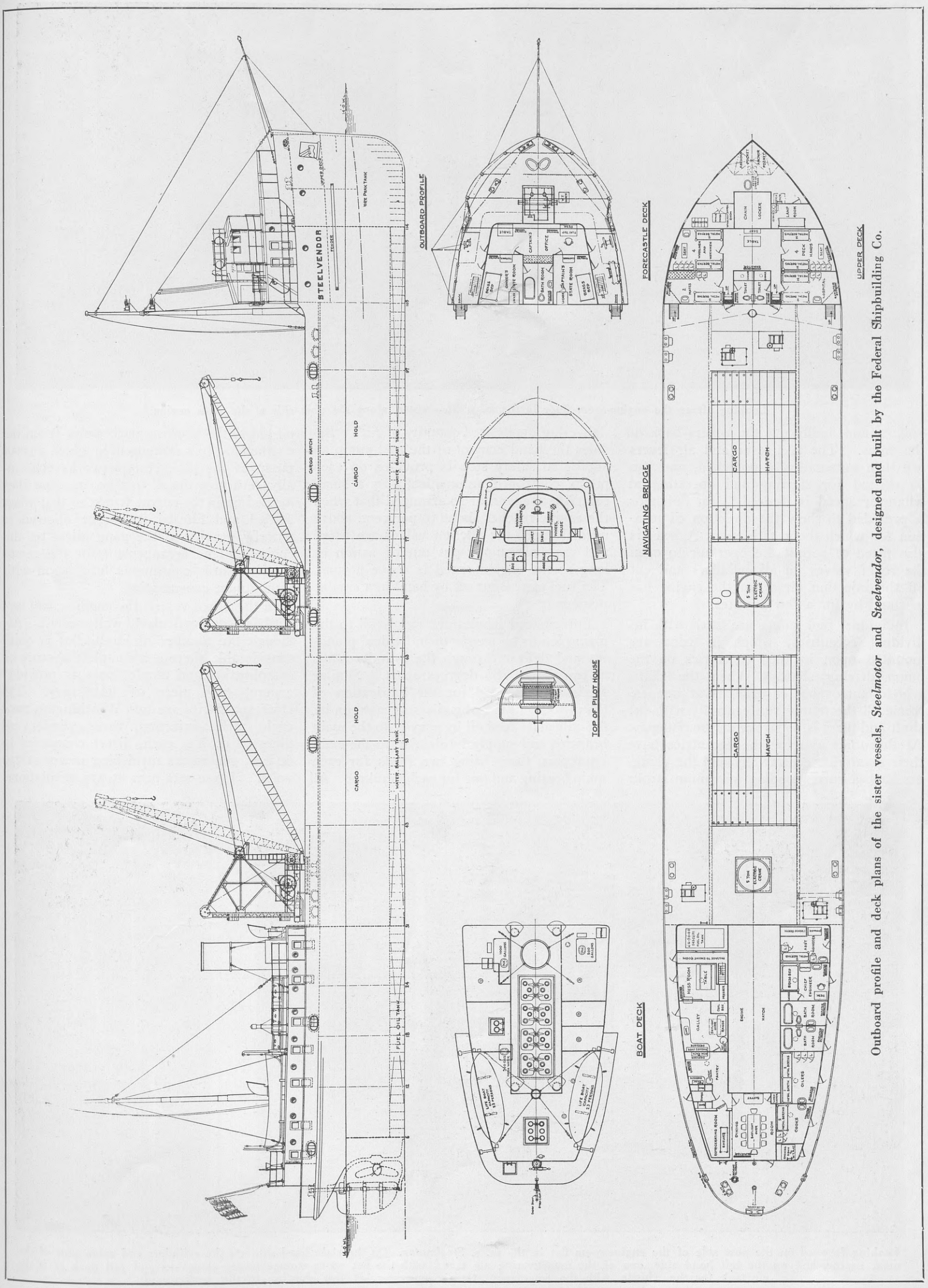


**Outboard profile and deck plans of the sister vessels, *Steelmotor* and *Steelvendor*, designed and built by the Federal Shipbuilding Co.**

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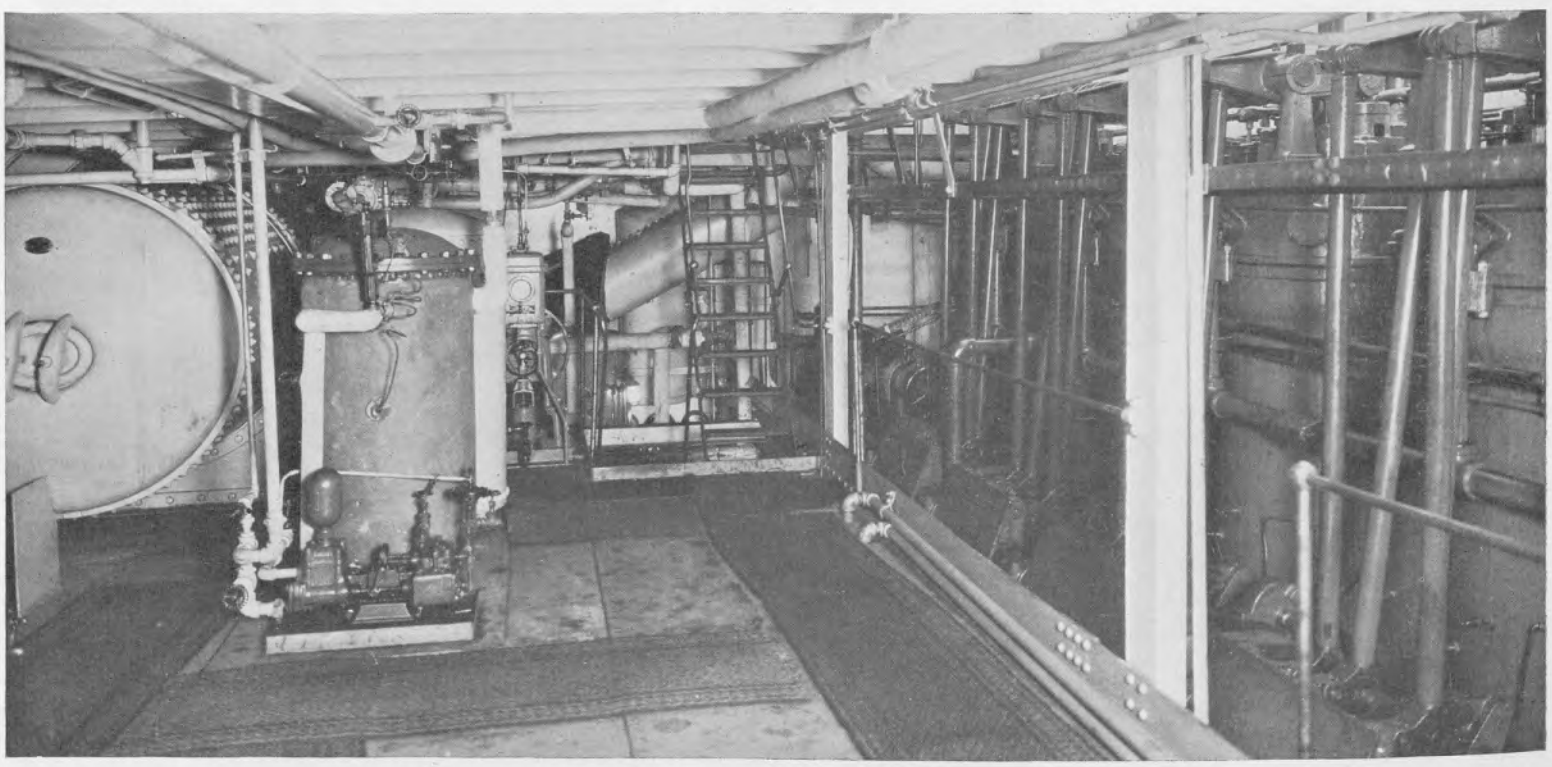
**Looking aft on the engine-room floor in the m. s. *Steelmotor*, along the port side of the main engine**

rollers, and finally put the rollers back on the cams. The fuel lever and air levers are then automatically unlocked, and can be shifted for starting and operating at whatever speed is desired. An indicator is provided to show the direction of rotation for which the gear is set. A lever is also fitted to permit the operator to open the relief valves on all cylinders and cut off the injection air when the engine has to stand by for a few minutes.

Individual fuel pumps are fitted with individual eccentrics, which in turn are mounted upon inclined eccentrics on the pump driving shaft. When the shaft, which is movable endwise, is at one extreme all the pumps run centrally with the shaft and there is no stroke on the plungers. At the other extreme the eccentrics have their maximum eccentricity and the plungers have a corresponding maximum stroke delivering the desired quantity of fuel. Besides the hand control of the fuel pump an additional safety stop is provided on each pump, controlled automatically by a small centrifugal governor so arranged that when the engine reaches about 10 per cent. above normal speed the suction valves are lifted and the fuel pumps put out of action as long as the engine speed is above normal. The fuel can be cut off by hand in a similar manner.

Forced feed lubricators supply oil to the main pistons by means of individual plungers and deliver through the cylinder walls at two places 180 degrees apart. Similar feeds are provided for the lubrication of the piston pins. Gang oilers situated under the camshaft feed oil by gravity to the main bearings and supply lubrication to the main crankpins, there being two feeds for each main bearing and one for each crankpin. All oil fed to the working parts flows down the engine base to a sump tank in which a small pump of the plunger type works continually, returning the oil to a marine type filter located up in the engine trunk, so that when settled and filtered it can be allowed to flow by gravity to the gang oilers on the engine. This arrangement for the re-use of oil ensures continuous lubrication with a minimum consumption.

In these two vessels the engine-room layout has been particularly well studied. Although the number of auxiliaries is quite considerable, there is a complete absence of complication and ample space is provided around each piece of machinery. The chief auxiliaries are two Worthington two-cycle, airless-injection, three-cylinder engines of 90 h.p. each, direct connected to 60 k.w. generators furnishing power at 230 volts. These sets turn at 375 revolutions.



**Looking forward on the port side of the engine-room flat in the m. s. *Steelmotor*. On the right hand side are the cylinders and valve gear of the main engine, and on the left hand side, one of the maneuvering air tanks, with the hot water storage heater alongside, and just back of it the air tank for the whistle, with the emergency steam compressor set just showing in the background**

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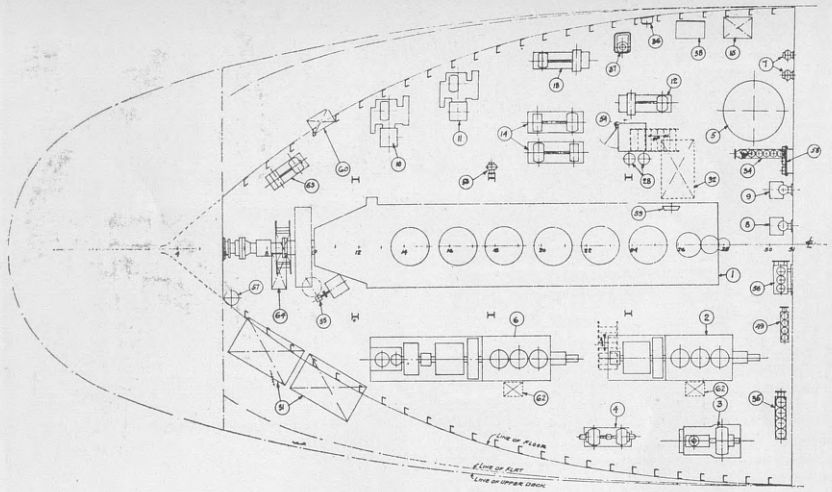
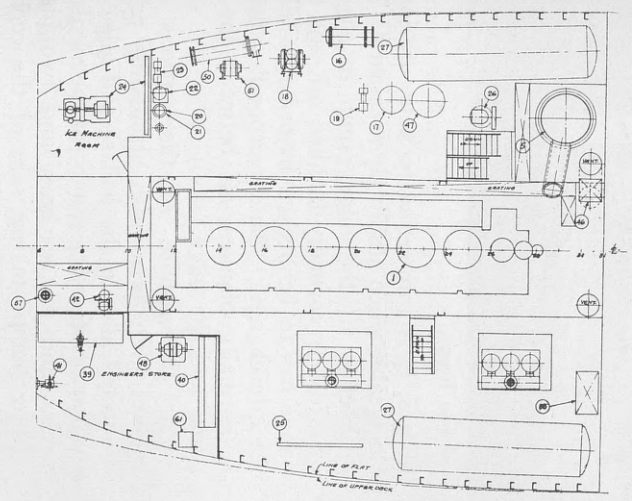
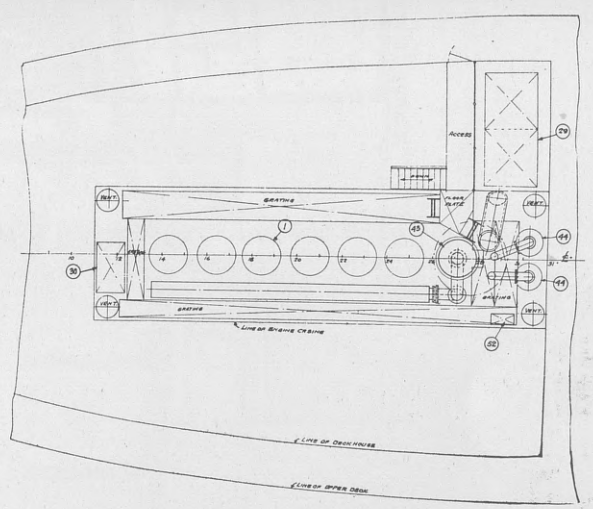
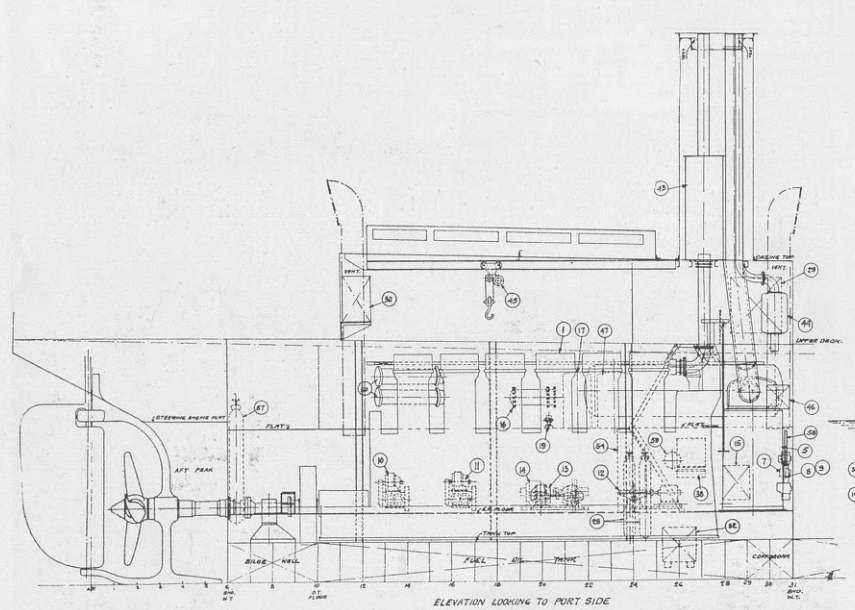
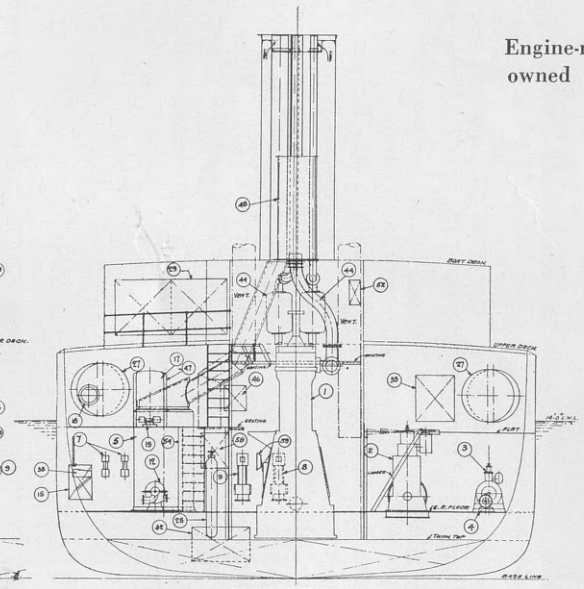


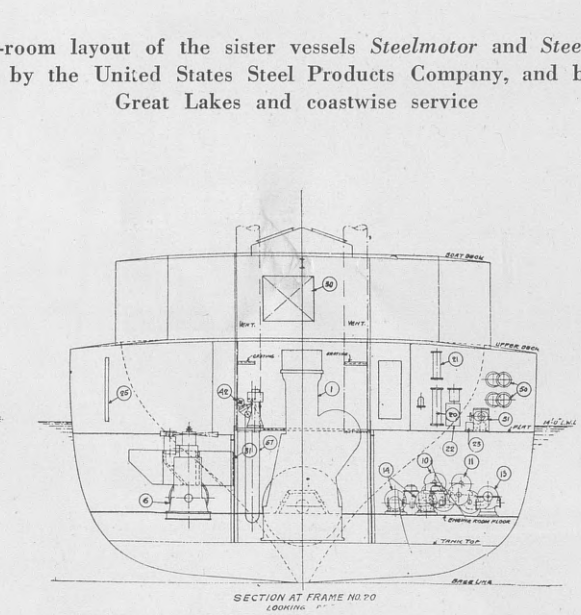




**Engine-room layout of the sister vessels *Steelmotor* and *Steelvendor*, owned by the United States Steel Products Company, and built for Great Lakes and coastwise service**




1. Main engine—6-cyl., 22″ x 32″, 750 b. h. p.
2. Main generator—3-cyl., 60 k.w., 240 v., d. c.
3. Aux. generator—1-cyl., 5 k. w., 115 v., d. c.
4. Motor generator——7½ k. w. Motor 240 v. Gen. 115 v., d. c.
5. Donkey boiler—335 sq. ft. h. s., 125 lbs.
6. Main generator—3-cyl., 60 k. w., 240 v.—with attached compressor.
7. Donkey boiler feed pump (2)—3″ x 2″ x 3″ v. d.—9 g. p. m.
8. Fuel oil transfer pump—6½″ x 7″ x 8″ v. s.—93 g. p. m.
9. Bilge and emergency F. O. trans. pump—6½″ x 7″ x 8″ v. s.—93 g. p. m.
10. Fire and bilge pump—7″ x 6″ h. d.—240 g. p. m. at 100 lbs.
11. Ballast pump—7″ x 6″ h. d.—240 g. p. m. at 100 lbs.
12. Aux. circulating pump—cent.—150 g. p. m. at 40 lbs.
13. Circulating pump—cent.—400 g. p. m. at 40 lbs.
14. Lub. oil pump—rotary—(2)—125 g. p. m. each at 40 lbs.
15. Feed and filter tank—storage capacity 80 gal.
16. Condenser, two pass., surf.—75 sq. ft. c. s.
17. Hot water storage heater—storage capacity 85 gal.
18. Circulating water discharge strainer—5″
19. Hot water circ. pump—3″ x 2″ x 3″ h. d.—9 g. p. m.
20. Evaporator—25 gal. per hour.
21. Distiller—25 gal. per hour.
22. Distilled water tank—20 gal.
23. Distilled water pump—3″ x 2″ x 3″ h. d.—9 g. p. m.
24. Ice machine and condenser—½ ton.
25. Switchboard.
26. Emergency air compressor—10 cu. ft. per min. at 1000 lbs.
27. Air tanks—maneuvering (2)—250 cu. ft.—350 lbs.
28. Air flasks—main injection (2)—12″ dia., 82″ long—1000 lbs.
29. Fuel oil settling tank—2 comp.—each compartment 3 tons.
30. Lub. oil settling tank—300 gal.
31. Lub. oil storage tank (2)—each 300 gal.
32. Lub. oil drain tank—300 gal.
33. Kerosene tank—200 gal.
34. Bilge manifold—six 3″ valves.
35. Ballast manifold—four 6″ valves.
36. High main sea chest.
37. Low main sea chest.
38. Log desk.
39. Work bench with vise.
40. Bins.
41. Hand drill.
42. Separator (lub. oil)—De Laval, 120 gal. per hr.
43. Silencer for main engine.
44. Silencer for generating set (2).
45. Trolley chain hoist (3 tons).
46. Inspection tank—working capacity, 28 gal.
47. Air tank for whistle—30 cu. ft. at 125 lbs.
48. Motor driven grinder—3 h.p., 220 v., d. c.
49. Ballast manifold (wing suct.)—four 3″ valves.
50. Lub. oil coolers (2)—160 g. p. m.
51. Lub. oil duplex strainer—3½″.
52. Lub. oil gravity tank—capacity, 33 gal.
53. Lub. oil transfer pump—3″ x 2″ x 3″ v. d.—9 g. p. m.
54. Telephone booth.
55. Turning engine.
56. Fuel oil cock manifold.
57. Reserve injection air flask—15¼″ dia. by 120″ long.
58. Gauge board.
59. Mechanical telegraph.
60. Engine room oil tank—2 compartments—capacity each, 30 gal.
61. Waste tank—5 cu. ft.
62. Generator lub. oil drain tanks (2)—capacity, 30 gal.
63. Lub. oil drain pump—rotary—40 g. p. m. at 20 lbs.
64. Aft lub. oil drain tank—40 gal.

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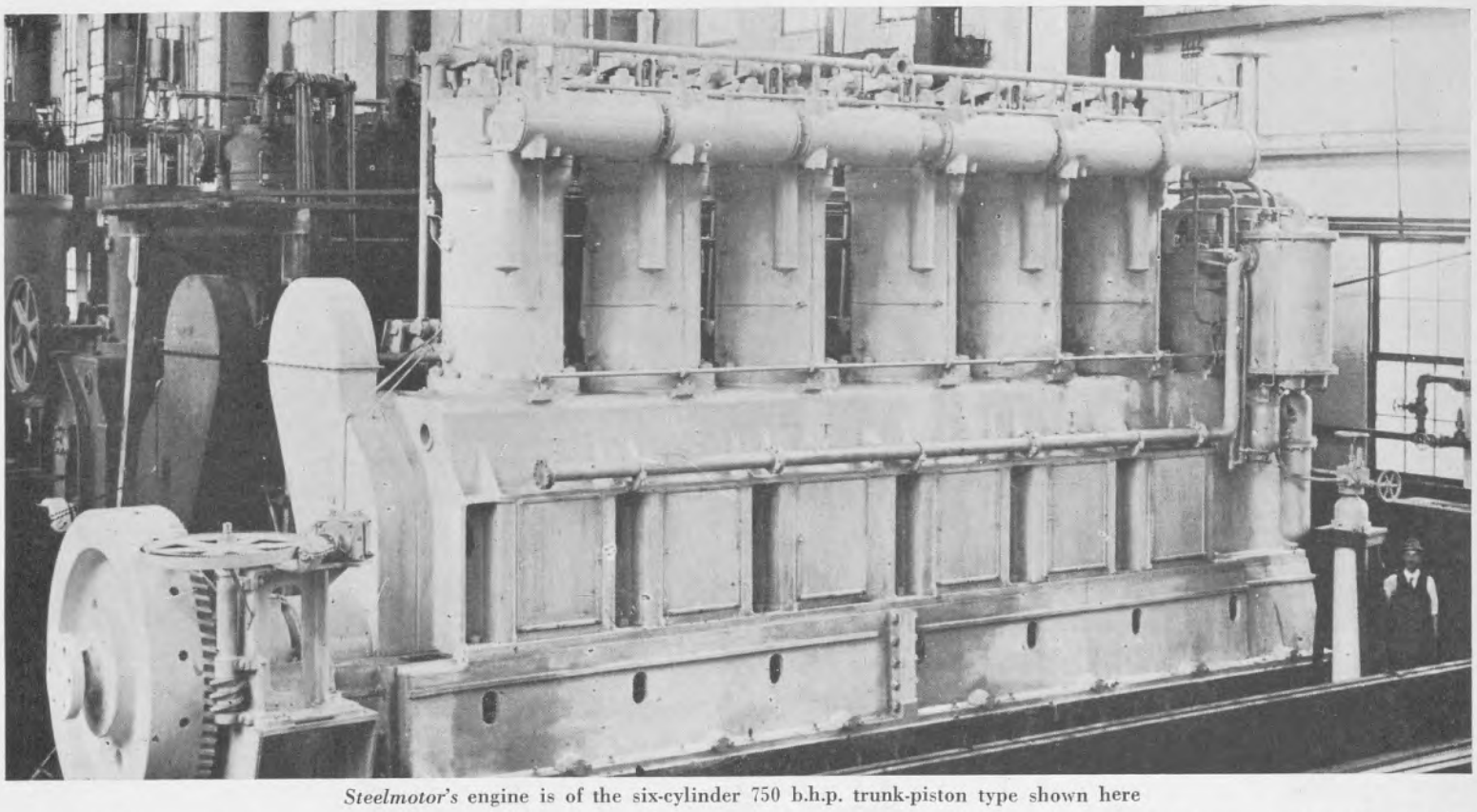


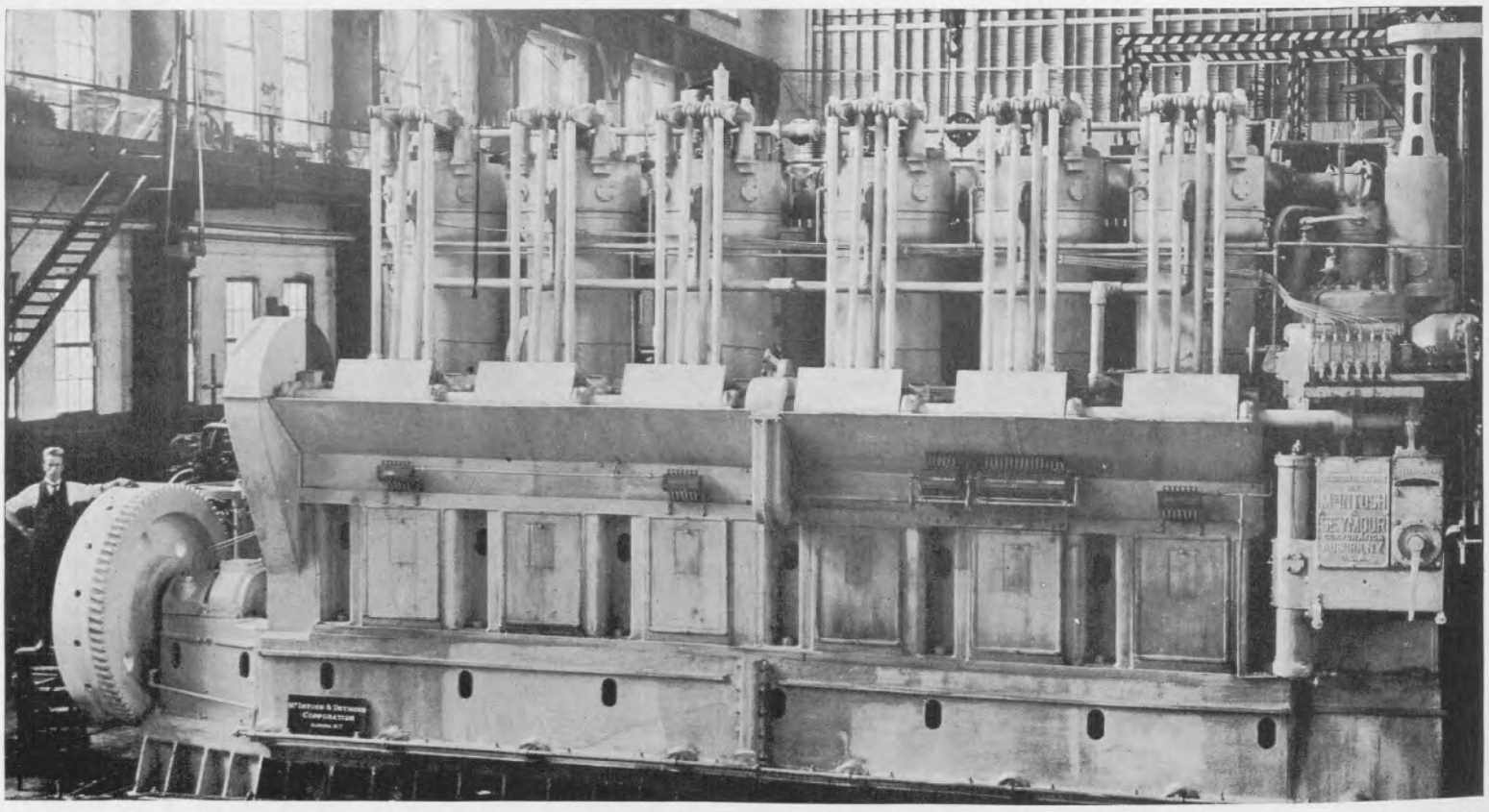
*Steelmotor's* engine is of the six-cylinder 750 b.h.p. trunk-piston type shown here

On one of the sets, the generator end can be connected through a Cutler-Hammer magnetic clutch to an auxiliary air-compressor, which is of the crosshead type with three stages and double-acting on the low stage. This is a Worthington compressor.

When the main generators are shut down, the current for lighting purposes is taken from a 5 k.w. Mianus set direct connected to a G. E. generator. This will be used chiefly in port. Under other conditions the lighting circuit is connected to a 7½ k.w. Diehl motor generator set, giving a voltage of 115.

The only auxiliary not electrically operated is the emergency air-compressor used for pumping up starting air after a survey or overhaul. This is a steam set with a two-stage Feather-valve compressor, delivering air up to 1,000 lb. per sq. in. Steam for this set is supplied from a donkey boiler, which is fired continually on the Lakes in order to provide steam for the distilling apparatus that provides the drinking water. In cold weather a steam coil heats water for the heating system of the ship. Steam can also be used for the emergency bilge pump and fuel-oil transfer pump, but both of these can also be operated by compressed air. These two pumps, it is interesting to note, are interchangeable when absolutely necessary. The connection of the bilge pump to the oil manifold is normally blanked off, and this flange has to be broken in order to allow the interchange. The corresponding flange is normally blanked off between the oil pump and the bilge.

For the service of the various oil-engines there is a main circulating pump connected also to the ballast and bilge, an auxiliary circulating pump for the auxiliary engine and ice machine, and two piston cooling pumps taking care of the cooling oil which is circulated through the pistons



This view of a 750 b.h.p. McIntosh & Seymour engine shows the valve gear, fuel pumps and control. It is of exactly the same design as the engines in the *Steelmotor* and *Steelvendor*, but is built for running in the opposite direction and is used here to show the type of mechanism

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of the main engine. This piston cooling oil is chilled by the circulating water at the intake, after the water has passed through two strainers (there are two sea cocks, one low and one high, on account of the service into which these boats go). There are also two Griscom-Russell multi-whirl coolers for the oil, with thermometers on the inlet and discharge. To help economize in the lubricating oil consumption a De Laval purifier has been installed. There are two other pumping sets in the engine-room, both of which are double-acting duplex pumps with connections for ballast, bilge, fire and engine.

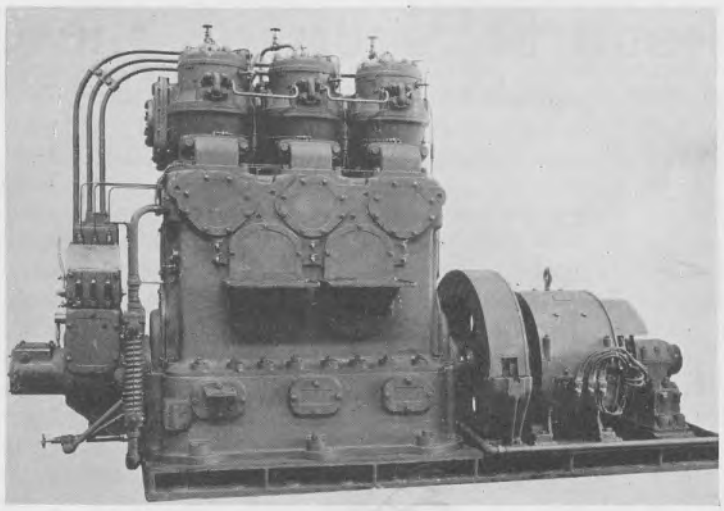
Throughout these ships all pumps are of Worthington make and all the electric motors, with one exception, have been built by the Diehl Manufacturing Company, which has also supplied the large generators.

As showing the careful attention to detail, which has been manifested throughout the whole engine-room installation, one may note that a pyrometer has been fitted of the Haskins type, with connections to the cylinders not only of the main engine, but also of the two auxiliary Worthingtons.

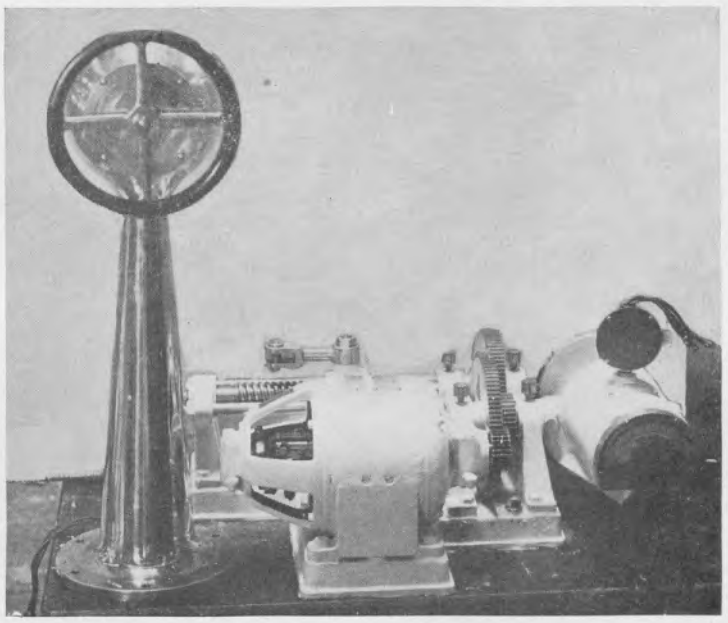
Good care has been taken of the supply of maneuvering air, in view of the fact that these boats will have a good deal of maneuvering to make in the locks of the Welland Canal. Two extra large tanks are fitted containing air at 350 lbs. The whistle tank, which holds air at 125 lbs., is filled through a bleeder from either maneuvering air tank.

For the steward's department and for drinking water, ice is supplied by a ½-ton Brunswick ice machine, electrically operated.

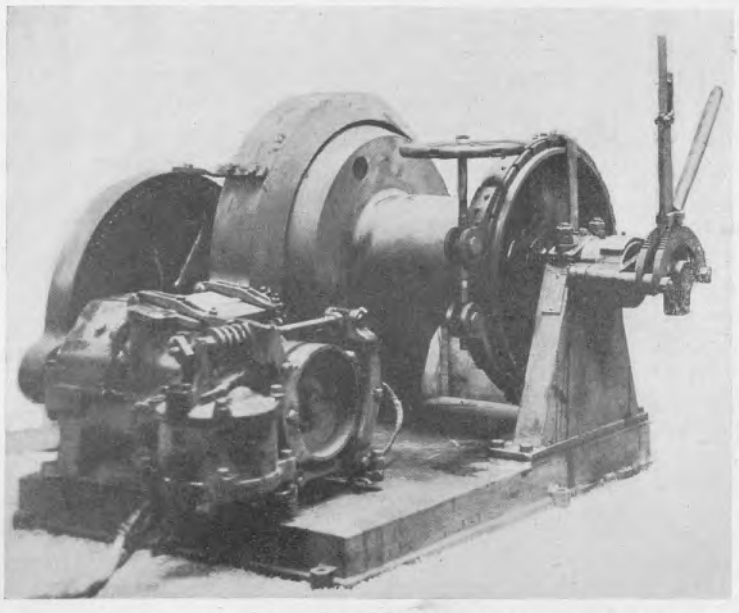
Owing to the installation of the machinery aft, the steering engine in these vessels is in the engine-room. It is of the electrically-driven quadrant type built by the Hyde Windlass Company, and controlled by the new Hyde electric telemotor. The quadrant is made in two sections for clamping to the rudder stock, and the rack teeth are machine cut on three interchangeable sections. The worm-gearing runs in an oil bath and is fitted with a patent expanding clutch which can be adjusted to take the maximum load for steering the ship. In case, however, an unusual force is brought to bear on the rudder from outside, such as for instance would happen if the vessel backed into the mud, or an unusual heavy sea were to strike the rudder, this friction clutch would slip, preventing damage to the rudder or rudder stock, and when the force is removed the steering gear would automatically return to its original position. The steering gear is equipped with a 20 h.p. marine watertight General Electric motor fitted with a solenoid shoebrake.



Three-cylinder 90 h.p. Worthington oil engine driving 60 k.w. Diehl generator for electric power on the new Isthmian Line motor vessels



Composite picture of the three units of the electric telemotor control of the steering gear of the motorships *Steelmotor* and *Steelvendor*



One of the four Hyde electric winches installed on each of the new Steel Corporation's motorships

In the new Hyde electric telemotor, which is of the contactless type, there are three units—one being the column and wheel located in the pilot house and containing in its head an induction transmitter, the second unit being a follow-up mechanism located aft, in close proximity to the valve of the steering engine and with the induction receiver self-contained, and the third unit being the polarized relay which makes the d.c. contacts for operating the small motor that moves the valve of the steering engine. The only connection between the transmitter and the receiver are three small wires, two of which are in multiple with the line supplied and the third being the control wire. The corresponding angle of the transformers in the transmitter and receiver regulates the current in the control wire which passes through the armature of the relay, holding it in a vertical position between the two contacts, or turning it to right or left. With this telemotor very fine rudder angles can be obtained.

For warping the vessels there are four Hyde winches installed on each ship, each winch being equipped with a 15 h.p. marine watertight compound wound Diehl motor, with Cutler-Hammer control and magnetic brakes. There is a hand gear fitted to enable the drum to be ratcheted over and line taken in when current is not available for the motors.

The windlass is of the spur geared type with two wildcats for handling chain, and each wildcat fitted with independent locking gear. Large warping gypsies are fitted on the intermediate shaft. Power is provided by a 35 h.p. watertight motor self-contained with the windlass and with watertight drum control.

On the Lakes these boats will have a Chief Engineer, two assistant engineers and three oilers, but in the coastwise trade must carry another assistant engineer and an additional oiler. The daily fuel-consumption is expected to be about 3½ tons, and the fuel-consumption in port about 50 gal. per day.

Both vessels will stay on the Lakes just long enough to get out of the St. Lawrence before the ice shuts in about the middle of November.

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# Motorships and Steamers on the Great Lakes

## *Comparative Operating Costs of the Motorship Fordonian and of Various Steamers*

By W. M. CONNELLY

BUILT in 1912, the FORDONIAN is 250 ft. b.p., 42 ft. 7 in. beam and 23 ft. 7 in. registered depth. Designed to carry package freight for Canadian owners and equipped with booms and between decks, she was first operated in the service between Fort William, Ont., on the north shore of Lake Superior, and Montreal.

Originally equipped with one 750 b.h.p. four cylinder two-cycle 120 r.p.m. Diesel engine, her early career on the Lakes in the Montreal service was of a most discouraging character. She and the CALGARY and the TOILER were the first and only Diesel ships on the Lakes, all designed for the Montreal trade. The CALGARY was taken to the coast subsequently and bigger engines installed—she is now the BACOI; the TOILER'S Diesel was taken out for a steam reciprocating engine; and the FORDONIAN went to the coast. That left no Diesel ships on the Lakes, and until the return of the FORDONIAN last Fall, no other Diesels were here. Today the FORDONIAN and two new Welland Canal ships operated by the Isthmian S. S. Co. for the U. S. Steel Products Co. are the only Diesels operating on the Great Lakes, but will shortly be joined by the refrigerator boats of the Minnesota-Atlantic Transit Co.

When the FORDONIAN first came to these waters her speed was variable and ranged from seven or eight miles per hour to practically and sometimes nothing. Her fuel consumption was around 7 tons a day. I do not recall the prevailing prices of oil or coal at that time, but, as my recollection serves me, on that basis steam was less expensive than Diesel. This might be verified through the Canada Steamship Lines.

### Description of Trade Routes

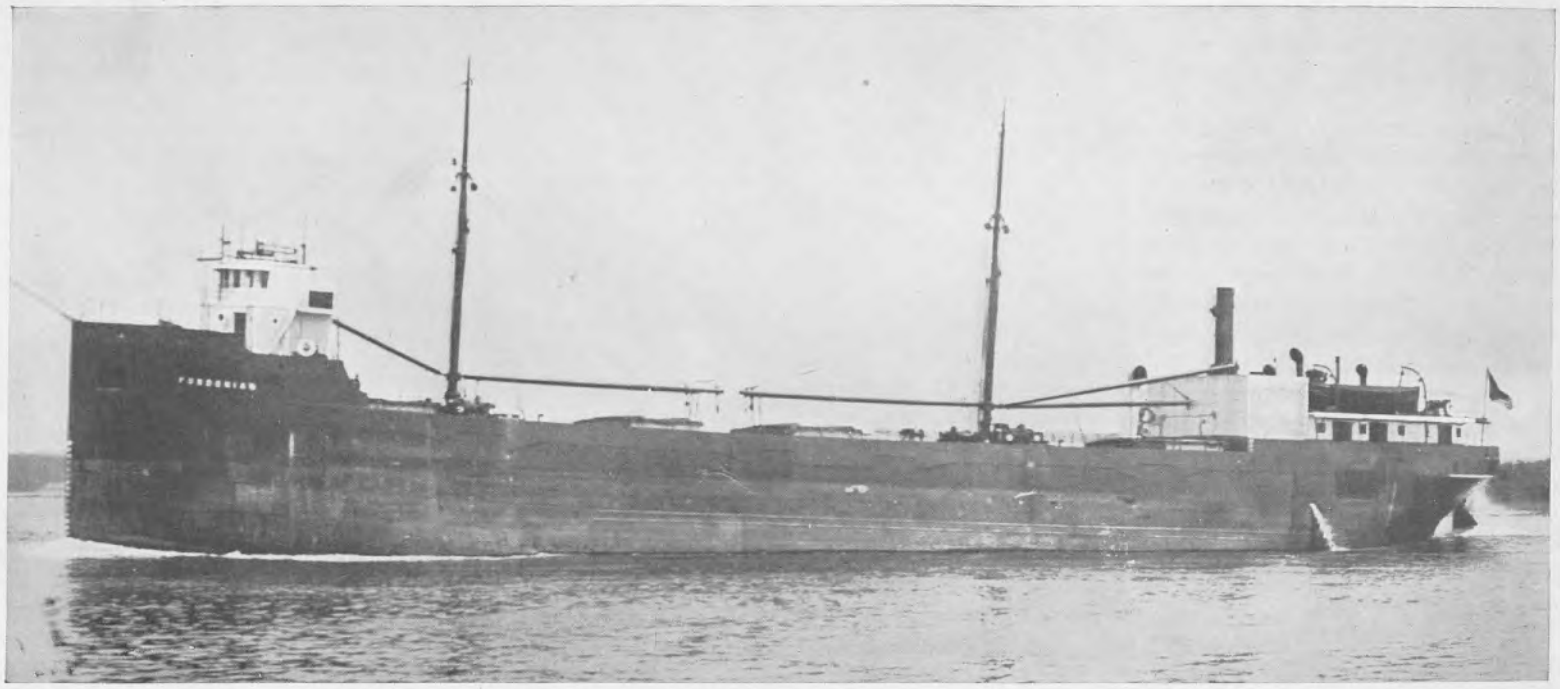
To have a better understanding of the difficulties these early, and perhaps experimental, Diesel ships had it would be well to understand the nature of the waterways upon which they were engaged.

The distance from Duluth to Montreal is 1339 miles, from Fort William to Montreal 1217 miles, and from Duluth to Fort Colborne 971 miles. From Duluth or Fort William to Port Colborne, no stops are normally made, except to lock once at the Soo from Lake Superior to Lake Huron through the Soo River. It is a straight run down lakes and rivers to Port Colborne, the entrance of the Welland Canal, connecting Lakes Erie and Ontario. In this canal, 27 miles long, there are 25 locks, 270 ft. long and 45 ft. wide with an average depth of 14 ft. over the sills. The lift between Lakes Ontario and Erie is 327 ft. Then follows a run across Lake Ontario and the St. Lawrence River to Cardinal Canal, a few miles below Ogdensburg, N. Y.—222 miles from Port Dalhousie, the Lake Ontario terminus of the Welland Canal. From Ogdensburg to Montreal follow 120 miles of river, canals, small lakes and rapids. There are six canals to use and 21 locks, making a total of 46 locks between Port Colborne and Montreal. Down bound to Montreal it is not necessary to go through the canal at Cardinal or Morrisburg if the water is high enough to go around Sparrowhawk Point or the Rapide Plat. The Rapide Plat is particularly dangerous, and miscalculation means the best part of a constructive total loss. It is a stretch of waterway about three miles long and a "rapids" in every sense of the word, including appearance. To make the Morrisburg canal is a steamboating work of art.

From Ogdensburg to Montreal, a distance of 120 miles, a good handling ship does well to make the run in 30 hours. It is a dangerous stretch of waterway calling for more frequent exercise of judgment, quick decision and general "steamboating" ability than any other place on the Great Lakes. An additional pilot is generally taken on before entering this part of the river to assist in navigating the ship. Men qualified to speak on the subject say it is the hardest "steamboating" in the world, and it does not tax credulity to believe it. The vessels must be real ships as well to stand the punishment.

In the canals using the water for powerhouses, the currents are vicious, and, paradoxical as it may seem, it is not unusual to find the stern going faster than the bow. Only instant action in pilot house and engine room will save the bow or the wheel and shoe and rudder when this happens. The Cornwall Canal, skirting the Long Soo, is particularly obnoxious—likewise the Lachine—in this respect.

All this bears upon the history of the



**Since conversion to Diesel electric propulsion this motor vessel, *Fordonian*, has lived down her earlier bad reputation**

FORDONIAN to show what was expected of her engines. The speed of a ship in this trade, to handle properly and stem the currents, should not be less than nine miles an hour. So if the FORDONIAN had been a steamboat, with the speed she was capable of developing with her Diesels, it is difficult to see how she would have been anything but a failure.

### Fordonian Experience

FORDONIAN made a malodorous record on the lakes and it is still tradition, not entirely lacking in historical fact either, that she usually stopped headway by running into a dock. The early record of FORDONIAN did a great deal towards killing the possibility of development of motorships on the Lakes and more especially in the Montreal trade where the difficulties are too apparent for further comment. So when she returned to the Lakes a year ago everybody was ready to condemn the Diesel promptly and made speedy prophecy of dismal failure. They did not know she was an electric ship now, and it would not have mattered if

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they did know. It is with some confusion I must admit having been one of the skeptics, and, like a good many others more or less familiar with the business, predicted all sorts of unhappy experiences for the FORDONIAN. I was not converted to the Diesel, but still retained the lake prejudice for steam.

Having some experience in investigating facts during seven years with the Admiralty Law firm of Goulder, White & Garry, of Cleveland, it really finally dawned on me that perhaps this would bear a little looking up before hurdling conclusions. With this in mind, I made several visits to the FORDONIAN in Buffalo and found that condemnation of the propulsion had no foundation in fact. The engines and motors functioned perfectly at all times and were so responsive that I fancied the people responsible for giving signals could not accustom themselves to the rapidity. They found found themselves like a dray driver thrust into a Twin Six. At any rate, the mishaps she had simply could not be attributed to the engines.

Since June 2, FORDONIAN has been engaged in the grain trade between Duluth, Fort William, Buffalo, Port Colborne and Chicago-Montreal. Her Diesels have not failed at any time and her electric motors have been mechanically perfect in performance. On a few trips, it was found advisable to shut off one Diesel, but that was only for a few minutes and the other generated enough to maintain way. The result was a temporary reduction of speed from 10 to 8 miles per hour. It was no inconvenience the few times it occurred.

A new captain is in charge of the ship this year—James Woods, an experienced Great Lakes and St. Lawrence River man. The entire deck crew is new, but the engine room crew is retained. He is enthusiastic about the way FORDONIAN handles in close quarters and says the Diesel-electric is superior to any steamboat he was ever in. So far this year she has been very fortunate in keeping out of trouble in a trade where trouble abounds even with the most careful handling.

In the lake the FORDONIAN carried 123,000 bushels of wheat, and in the canal to Montreal she carried 70,000 bushels. To the best of my knowledge and belief that is the heaviest load any ship her size ever carried in the lake or through the canal to Montreal.

At the speed of the Diesels, 200 r.p.m., recommended by J. E. Marwitz, superintendent, who installed the first Diesel electric, the FORDONIAN generates 850 b.h.p. She could turn over faster and still be within peak, but Mr. Marwitz believes in running the motors and engines under their rated speed, being of opinion that the additional speed would not justify the higher r.p.m., and so far as FORDONIAN is concerned the theory works out admirably and we have no engine or motor trouble.

This gives her a speed of 9 miles per hour at 20 ft. draft and 10 on canal draft of 14 ft. 3 in., at an average of 106 r.p.m. propeller. The speed is satisfactory and all that can be expected of a ship her size with that power. It is somewhat slower than the big Lake ships, but about the average speed of Montreal traders. The time consumed on a run from Chicago to Montreal, her most recent voyage, was seven days. That is satisfactory, considering she had a full load on the lakes and lightered at Colborne for canal draft to Montreal.

### Cargoes Available for This Size Ship

For general Great Lakes trade, consisting of coal, ore and occasionally grain, a ship the size of the FORDONIAN is too small for profit, as a broad proposition. Today on the Lakes, unless operated in connection with a large fleet of big ships, a ship under 7,500 tons d.w.c. has no easy time to make a showing.

A 3,800-ton steamer would not be worth operating unless freights were abnormal in the lake trade. But a ship like the FORDONIAN, carrying 3,800 tons in the lake and 2,100 tons to Montreal, has a fair chance in any normal period. Her operation generally speaking, would be coal from Lake Erie to Lake Michigan or Superior, and grain to Montreal. Then, in my opinion she would have to be a Diesel ship to justify operation.

Last year and the year preceding, the Buffalo-Montreal grain trade was brisk, the rates averaging around 7c. wheat from Colborne and Buffalo to Montreal. During a boom lasting through October, 1922, the grain rates reached a peak of 18c. and, it is rumored, better. This was largely attributable to the fact that Buffalo grain could not be moved on account of lack of cars due to the strike on the railroads when equipment broke down, and to the fact that Montreal was plugged with grain. Ships—lake and canal—were literally being used as grain storehouses, which caused big delay to the carriers. During this period of unnatural economic conditions—never, so far as I know, experienced in the trade previously—many concerns decided to build canal ships. They built ships carrying 90,000 bu. through the canal.

Last year and the year preceding I operated a steamer in the trade. It was not unusual even then to find as high as 38 canal ships in Montreal awaiting the elevators. From Buffalo there is now practically no grain for Montreal and seldom if ever is any, unless Port Colborne is congested and cannot take care of the grain laden ships. Port Colborne being the natural path of least resistance for grain to Montreal, Buffalo gets none for Montreal under normal conditions, because normally Colborne can take care of it as fast as Montreal can receive and ship it. When it cannot, the remedy is not more ships, but more terminals. The ships already in the canal trade were sufficient for the purpose. Partly as a result of the tremendous additional capacity a grain rate of 6½c. today prevails from Chicago to Montreal, and many of the carriers that would normally take it at Colborne or possibly Buffalo, must go there or Fort William for a canal cargo. At these rates only the most efficient ships can survive, and just what is the most efficient ship in that trade is something about which considerable difference of opinion exists. It may conservatively be said that the trade is badly overtonnaged. It was not unusual last year for a ship to leave Montreal and return loaded again, to find many of the same ships in port that were there upon her departure. Repeating what has been hereinbefore stated, that argues for new terminals and not new ships.

### Possibilities for Lake Motorships

Whether or not the Diesel or Diesel electric will get a foothold on the Great Lakes in general ore, grain and coal trades is a question. The fuel reasons that militate in favor of ocean-going ships, where price and bunkerage space on long voyages are vital, do not present themselves here. Coal is plentiful and in the main reasonable in price, and coal docks for fuel are scattered all over the Great Lakes and Rivers. Except in times of strike the fuel problem is not serious. The ships are big, and the hauls compared with ocean hauls are short. Bunkers on lake ships are located aft with the boilers and engines, and fuel is taken through a bunker hatch, with little or no trimming or stowing, in sufficient quantity to serve the ships a round trip from Lake Erie ports to Duluth. It is reasonable to take an average price of not over $6 per net ton for fuel and in varying quantities, according to the size of the ships.

A deterrent, however, is not whether the Diesel would be more economical in operation, but the very practical question of cargo. It is usual for the shipper loading the upbound coal cargo to fuel the ship. If the ship declines to take his fuel, the cargo owner will very likely seek elsewhere for carriers. In other words: no fuel, no cargo. Perhaps a more cogent reason why the Diesel will have opposition is the ownership or domination of vessels by joint coal and ore interests. It would not be reasonable to expect people owning ships and coal to use oil for fuel when they have plenty of cheap coal of their own to dispose of.

It may be if Diesel ships are employed, competition will compel these interests to do likewise. But as there is no such competition at present, the question is one for the future.

Another drawback is the lack of competent personnel on the lakes to operate Diesel engines. Lake engineers are all steam. To make a sudden transition to Diesel without competent engineers would be questionable judgment.

### Oil Fuel

I have referred to the ease in procuring coal fuel along the Great Lakes. The reverse is true about fuel oil. To some extent on this account, several Shipping Board type "Lakers" burning oil, were converted last year to coal burners. On the FORDONIAN we find bunkering a problem, and it involves considerable loss of time except at Sarnia, Ont., on the St. Clair River. Otherwise, in American ports we find fuel is not available in sufficient quantity or accessibility for commercial purposes except in Buffalo and Toledo. Even there, while the prices are not unreasonable—being 5c. per gal.—the

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deviation from course necessary for the purpose of fuelling is about eight hours. That is inconvenient. However, I am advised, whether reliably or not, that responsible oil companies are contemplating putting oil barges, for fuelling lake ships, in service on the Detroit River, and they will supply Diesel oil to ships under way.

### Place and Opportunity for Diesel Ships

For a canal ship, either in the Welland-Montreal trade or the New York State Waterway run, carrying general merchandise, in my judgment the Diesel or Diesel-electric is the correct propulsion. Particularly in the New York waterways, where light draft and bunkers and compact propulsion are the problems, does the Diesel show advantageously. The weight of steam engine, boilers, coal fuel and the space they would occupy in a small ship restricted in length, beam, depth and superstructure, would seem to preclude their possibility as a success on the New York waterways. Everything in this trade, including economy of operation, favors the Diesel. The question to debate would seem not between steam and Diesel—the argument is overwhelmingly in favor of the Diesel, although with greater initial cost—but the question lies between the straight Diesel and the Diesel-electric.

Is the Diesel-electric worth the difference in cost over the twin screw Diesel? In the case of the FORDONIAN, her electric drive for canal work is ideal; the cost of upkeep so far, nothing. Not having had actual experience with a straight Diesel in this business, I would not hazard an answer categorically, but from what I have observed the Diesel would seem sufficient for the purpose and in some respects, assuming no unusual difficulty in starting, stopping and reversing frequently, even more economical to operate than the electric drive. In the case of the electric drive, the Diesels, of course, do not necessarily stop. During the frequent delays in locks, and while waiting for other ships to pass, the engines are in constant operation. Only the shaft motors stop. The engines are using fuel, running idle. A straight Diesel would stop and the fuel consumption with it. I realize the dispute that naturally follows such a query and the many things to consider before a conclusion is reached. That is largely an engineering question, and I do not attempt to pass upon it, only registering the belief that the Diesel, whether electric or not, would do the work from a navigational point of view.

### Combined Lake and Canal Ships

I would like to put in a line of ships to run from Chicago and other lake ports to New York via New York State waterways. They would be Diesel driven. They would likewise be sufficiently seaworthy for the Great Lakes and canals, and in no way violate the established principles of shipbuilding. Here again the FORDONIAN'S early record acts as a boomerang. When the truth about FORDONIAN gradually becomes known even in marine circles, it may dissipate the fog of ignorance that prevails about her performance and operation. But in this respect, I am estopped against complaining, having shared that ignorance until investigation led me into the light.

The one place left in any Lake trade for development, really offering romance, is the possibility of ships properly designed and engined for the Chicago and other Great Lakes ports to New York trade.

Two ships are being constructed in Ashtabula for the Duluth-New York refrigeration trade, Diesel electrically driven. If their Diesels and electric equipment give the satisfaction of FORDONIAN'S they will have no cause for complaint on that score.

It is a popular marine superstition that ships cannot trade through New York waterways and the Great Lakes with safety. Not generally known, even in usually well informed marine circles on the Lakes, a bigger canal carrier can go to New York through the New York waterways than can go to Montreal. The misinformation is enhanced when obsolete canal boats now on the New York waterways attempt to go across Lake Erie. They are too frequently wrecked. The best grain ships on the New York canal today are not fit to encounter the Great Lakes. They were not designed for that trade. It is generally thought that the overhead restriction of 15-foot clearance for bridges is prohibitive. That is not so. It is a blessing, not even in disguise, and simply imposes upon the designer the necessity of reducing superstructure and let the ship carry in cargo the weight thus eliminated. The most efficient Great Lakes-Montreal traders are not over 20-ft. moulded depth. With the superstructure removed these ships could go through the New York waterways to New York. They navigate the Great Lakes in all seasons, and no better seaboats were ever designed on the Lakes than the old "Wolvin" type Welland traders. The New York canal, while shallower, is more modern in equipment and locks, and is capable of handling the most efficient canal ships, fit to run the Lakes as well as the best Montreal traders. Yet we hear the solemn pronouncement occasionally that "no ship is fit to run the Lakes and the canal." This is exasperating. After ships have been operating on the Lakes and Welland canal successfully for over twenty years, and through some of the worst storms the Lakes have ever known, such a statement is trying. The condition of the Welland-Montreal canals is somewhat, but not essentially, different from the New York canals, and, properly designed, Diesel ships can navigate the New York-Great Lakes water just as safely as the Montreal traders. Having operated a ship in the Great Lakes-Montreal trade three years, and having consulted with the best sailing, designing and shipbuilding talent available, I am not "radical" in thinking the statement "It Can't Be Done," not only false, but foolish.

### Cost Per Month

The figures below do not include insurance or depreciation. I invited several steamship companies to submit figures and many responded. The data are presented as submitted by these companies. The ships represented are good ships and well managed. With the exception of the UHRIG, the FORDONIAN will out-carry them. The JOHN, ex WESTOIL, more nearly approaches FORDONIAN in size and general characteristics. For purposes of comparison the JOHN is the best selection. I have asked her owners for further statement, but to date it has not arrived.

| | | | | |
|---|---|---|---|---|
| FORDONIAN ..... | cost per | month | | $6,089.10[1] |
| UHRIG ..... | " | " | " | 9,750.00[2] |
| JOHN ..... | " | " | " | 8,646.00 |
| LA SALLE ..... | " | " | " | 7,800.00 |
| WM. B. PALMER .. | " | " | " | 8,312.50 |
| INLAND ..... | " | " | " | 8,086.83 |

[1] Including donkey boiler. [2] Including insurance.

This list is not intended to be all inclusive, and the difficulty of comparing ships not identical in size and operation is obvious. Some other steamers the size of FORDONIAN may possibly be more economical than the ones submitted, but I do not know of any. I could mention several steamers far more expensive in operation than the above, but as they are hopelessly inefficient it would not be a fair comparison for the steam ship.

Until I see concrete evidence to be contrary I shall believe FORDONIAN to be *the* most economical ship of her size on the Great Lakes. When the donkey boiler is removed the comparison will be still more marked in her favor.

I am enclosing original letters from the steamship companies and wish to thank them for so kindly contributing to the general information.

### 1. Motorship Fordonian

For a 30-day period, out of which 19 days were running time.

| | |
|---|---|
| Groceries and meats ..... | $ 540.00 |
| Fuel for Diesel engine ..... | 1,530.00* |
| Fuel for donkey boiler ..... | 675.00* |
| Lubricating oils ..... | 151.20 |
| Wages (22 men) ..... | 2,722.50 |
| Deck, engine stores, inc. ..... | 470.40 |
| Total ..... | $6,089.10 |

* Daily measurement of oil tanks to determine amount used for Diesels and donkey boiler.

FORDONIAN carries a crew of 22 men, including three in the galley and two donkeymen to fire the donkey boiler. The owners plan on taking out the donkey boiler this winter and installing electric steering gear and deck gear, thus eliminating two of the crew, the weight of the boiler and the cost of its fuel. As it is, the donkey-boiler fuel costs nearly half as much as the cost of propulsion of the ship, to say nothing of loss of cargo due to its weight. It is expected to reduce operating expenses nearly $1,000 per month.

(The above figures are taken from the books of the company, McDonnell & Truda, managers, 5 State Street, New York City. *W. M. C.*)

### 2. Steamer Uhrig

"We never have had the operating books of the SIMPSON, so do not know anything about her cost, and the UHRIG, of course, is a much larger ship than the SIMPSON or FORDONIAN. It is costing us at the present time about $325 a day to operate the UHRIG, including insurance."

THE COLUMBIA STEAMSHIP COMPANY
Cleveland, Ohio

By JOHN T. KELLY.

(UHRIG is 5,000 tons d. w. c., 360'0" x 44'6" x 26'6". Her insurance probably costs $40 per day. *W. M. C.*)

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### 3. Steamer J. B. John

"Supplementing our letter of August 6th, we are tabulating below a statement of our operating costs of the steamer J. B. JOHN for the month of July this year:

| | |
|---|---|
| Operating labor | $3,153.91 |
| Groceries and supplies | 645.58 |
| Fuel | 2,131.63 |
| Repairs and supplies | 813.17 |
| Insurance | 797.38 |
| Depreciation | 885.71 |
| Lay-up expenses | 1,654.25 |
| Sundry | 242.21 |
| Total | $10,323.84 |

"We will be pleased to receive a similar statement covering the operating costs of your ship FORDONIAN."

PETOSKEY TRANSPORTATION CO.

Petoskey, Michigan H. H. Lucas

(J. B. JOHN, ex WESTOIL is 250'0" x 43'0" x 22'9". *W. M. C.*)

### 4. Steamer La Salle

"Replying to yours of the 24th inst. relative to cost of operation of our steamer LA SALLE. We figure this season up to date her cost of operation has been around $280 to $300 per day, including insurance. $260 per day would be about her actual cost, not including incidental repairs, which as you know are always developing. Fuel figures about $75 per day for this season up to date. The greater part of her fuel has cost $5.50 per ton at Lake Erie Ports."

Duluth, Minn. D. T. HELM & Co.

(LA SALLE is 266'0" x 38'0" x 24'0"; capacity given as 2,700 tons d.w. *W. M. C.*)

### 5. Steamers Niagara and Wm. B. Palmer

"At the request of Mr. Boland, the writer has figured the operating cost of the Strs. NIAGARA and WM. B. PALMER, for a period of a little over three months, and found the cost per month for operating each boat, not including insurance, to be $8,312.50. The average cost per month for fuel for each boat amounted to $2,340 or $78 per day for each boat."

Buffalo, N. Y. BOLAND & CORNELIUS.

(WILLIAM B. PALMER is 242'0" x 42'0" x 26'6"; capacity 3,000 tons d.w., and Welland Canal, 1,700 tons. NIAGARA is 226'0" x 42'0" x 20'0"; capacity 3,000 tons. *W. M. C.*)

### 6. Steamer Inland

"The following is a statement of the expense of operating the steamer INLAND from July 1, 1923, to June 30, 1923, inclusive."

| | |
|---|---|
| Wages | $2,850.45 |
| Fuel | 3,148,80 |
| Provisions | 1,142.81 |
| Oil | 126.28 |
| Ship chandlers' supplies | 335.03 |
| Repairs | 256.41 |
| Towing | 161.35 |
| Laundry, etc. | 65.70 |
| Total | $8,086.83 |

GRAIN HANDLING CORPORATION

Buffalo, N. Y. T. W. Kennedy.

(INLAND is now operated by James McAlpine, of Brown & Co. The work done on this ship has reduced her coal consumption 30 per cent under last year, and has more than justified the expenditure. The figures below are from the books of the company showing cost of operating Str. INLAND in the Great Lakes-Montreal grain trade from April 25th to October 25, 1922, at which time she was purchased by some Buffalo interests. Her fuel was high both in price and consumption. Considerable work was done on her last winter. Note that the fuel bill about equalled wages, provisions and supplies.

| | |
|---|---|
| Wages of crew (25 men) | $15,816.24 |
| Provisioning crew | 5,622.28 |
| Fuel (average about $8.00 per ton cost) | 23,276.74 |
| Repairs (upkeep and disaster largely insured) | 7,934.78 |
| Supplies | 3,029.64 |
| Miscellaneous | 4,019.17 |
| Towing | 609.01 |
| Trimming cargo | 100.23 |
| Total | $60,408.09 |

This was equal to $10,068 per calendar month, or about $2,000 per month more than she has been costing this year since her thorough overhaul last winter. The difference can be found in coal and repairs. *W. M. C.*)

### 7. Steamer Maytham

"Replying to your letter of the 6th inst., will give the cost of operation of the MAYTHAM for one trip last year, and one for this year, and they each took 14 days; details as follows:

"Stmr. THOS. MAYTHAM, Trip No. 8, running alone from Cleveland to the Soo with coal; 40,000 bu. flax Ft. William to Duluth; ore Duluth to Cleveland; August 14th to 28th, 1922—14 days."

| | |
|---|---|
| Provisions | $ 431.42 |
| Laundry | 13.30 |
| Cabin supplies and sundries | 56.53 |
| Engineers' supplies and oil | 143.36 |
| Wages | 1,112.36 |
| Fuel ($8.00 per ton) | 1,615.19 |
| Total | $3,372.16 |

"Stmr. MAYTHAM, towing barge TYRONE, trip from Cleveland to Soo, coal; ore from Supr. to Cleveland; May 23rd to June 6th, 1923—14 days."

| | |
|---|---|
| Provisions | $ 367.47 |
| Wages | 1,248.83 |
| Fuel ($5.50-$6.00 per ton) | 1,348.23 |
| Laundry and stove coal | 11.47 |
| Cabin supplies and sundries | 79.08 |
| Engineers' supplies and oils | 10.82 |
| Repairs | 63.75 |
| Total | $3,129.65 |

The MAYTHAM carries 3,500 tons ore and the TYRONE 4,200 tons.

THE GENERAL TRANSIT CO.

Cleveland, Ohio C. W. Bryson

### 8. Steamer Tampico

"Relative to your inquiry of the 4th instant, will say that we pay the standard Lake Carriers' wages on the Steamer TAMPICO, the Captain receiving $3,300 per year for our size vessel. She carries a crew of nineteen men.

"The TAMPICO has been carrying about 100,000 bushels, average of wheat and rye, with the coal bunkers loaded.

"The speed of this vessel is about 13 miles light and 10 miles loaded, on an average of 79 revolutions. She consumes approximately 1,000 gallons of fuel oil each six hour watch running, and about 50 gallons per hour lying at the dock."

Detroit, Michigan F. D. Gleason

(Oil burning steamer, 247'0" x 42'0" x 24'0", has almost three times consumption of FORDONIAN. TAMPICO consumes more oil at dock than it takes to propel the FORDONIAN. *W. M. C.*)

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A very large motor ferry has just been completed in Holland for use between Enkuizen and Stavoren in connection with the railroad service. This boat has been named W. F. VAN DER WIJCK, and was taken over by the Dutch Government railroad after a trial trip in the North Sea from Rotterdam to Den Helder, at the mouth of the Zuider Zee. Her principal dimensions are: length b.p. 202 ft., moulded breadth 31 ft. 4 in., moulded depth 12 ft. Her machinery consists of two four-cylinder Kromhout engines of 500 h.p. each, forming one of the most powerful installations of surface-ignition engines now in service. Accommodation is provided for about 2,000 passengers. The Kromhout engines in this vessel embody new devices of which much is expected.

For the new motorship service organized between Hamburg, Germany, and Northern Persia, via the inland waterways system of Russia, the ISPAHAN and JOGOHAN have been delivered. They are single deck boats with a carrying capacity of 1,100 tons, and are driven by a pair of two-cylinder Diesel engines. They were built in the Rüstringer yard of the Deutsche Werke A.G., to the order of the Deutsche Russische Transit-Handel Ges. The route lies through the Baltic to Petrograd, thence by the Marien Canal system to the Volga and down that river to the Caspian Sea. When conditions were normal in Russia, this same route was employed by the Nobel Bros. Oil Company in the distribution of fuel from the Baku region to ports of the Gulf of Finland.

A second motor tanker of 13,000 tons d.w. has been ordered by Westfal, Larsen & Co., of Bergen, Norway, in addition to the vessel of the same size which they contracted for this summer. The second vessel, like the first, will be built by the Nederlandsche Scheepsbouw Maatschappij, of Amsterdam, and will have twin-screw Werkspoor machinery of the SARDINIA type with cast engine columns. The speed of the boats will be 11 knots. In length they will measure 498 ft., with 60 ft. beam and 38 ft. 6 in. depth. The Werkspoor engines will have six cylinders of 26⅜ in. diameter and 47¼ in. stroke, with a speed of 115 r.p.m. The Nederlandsche yards will then have 11 motorships to their credit.

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# Vision of Barge Canal Builders Realized

## *Upper Lakes Region and New York Linked by Fast and Economical Motorship Service*

EVER since Theodore Roosevelt, during his term of office as Governor of the State of New York, appointed the Committee that developed the project of the Barge Canal connecting the Great Lakes with the ocean, it has been clear that men would have to arise who would bring the accomplishments of our modern mechanical age to bear upon inland water transportation with the same success as they have been applied to ocean carriage.

A total of around $125,000,000 has been spent in providing this water highway. In the eight years elapsed since the widened canal was first opened for traffic no steps have hitherto been taken to link the cities of New York State with the big Lakes cities in the way that the canal builders visualized. This canal was to carry the products of the Upper Lake regions to tidewater at New York at rates lower than the railroads could offer, and was to effect equal savings on the transfer of merchandise from incoming steamers at New York to big centers of consumption in the Middle West.

Oil engines have been introduced for the towing and direct propulsion of big canal carriers, but the vessels put into this service have been only fit really for canal work. During the course of this last summer The Standard Transportation Co. commissioned a motor tanker that could go anywhere coastwise or on the Lakes, but being a private carrier and only for oil cargoes she could not get the welcome reserved for a common carrier of her ability and excellence. The TROY SOCONY is a fine type of vessel and is the first of a fleet that will rapidly grow, her owners having just taken bids on six more vessels of her type.

It has remained, however, for the advent of the two Diesel-electric canal carriers in the Duluth-New York service to drive home the possibilities of the Barge Canal as a freight highway between the Great Lakes and the ocean. Designed to make the transit from the head of the Lakes to tidewater in 10 days, these boats can carry a trainload of merchandise from the West or Northwest to New York faster, cheaper and with less liability of damage than the railroads can.

When one reflects that the Panama Canal, which has given us the steamers on the intercoastal run between Atlantic and Pacific, permits the carriage of freight at 30-40 per cent. less than the transcontinental railroad rates, one can realize what great economies are destined to be brought about in the movement of bulk and package freight between the Lakes region and New York when routed via the waterway.

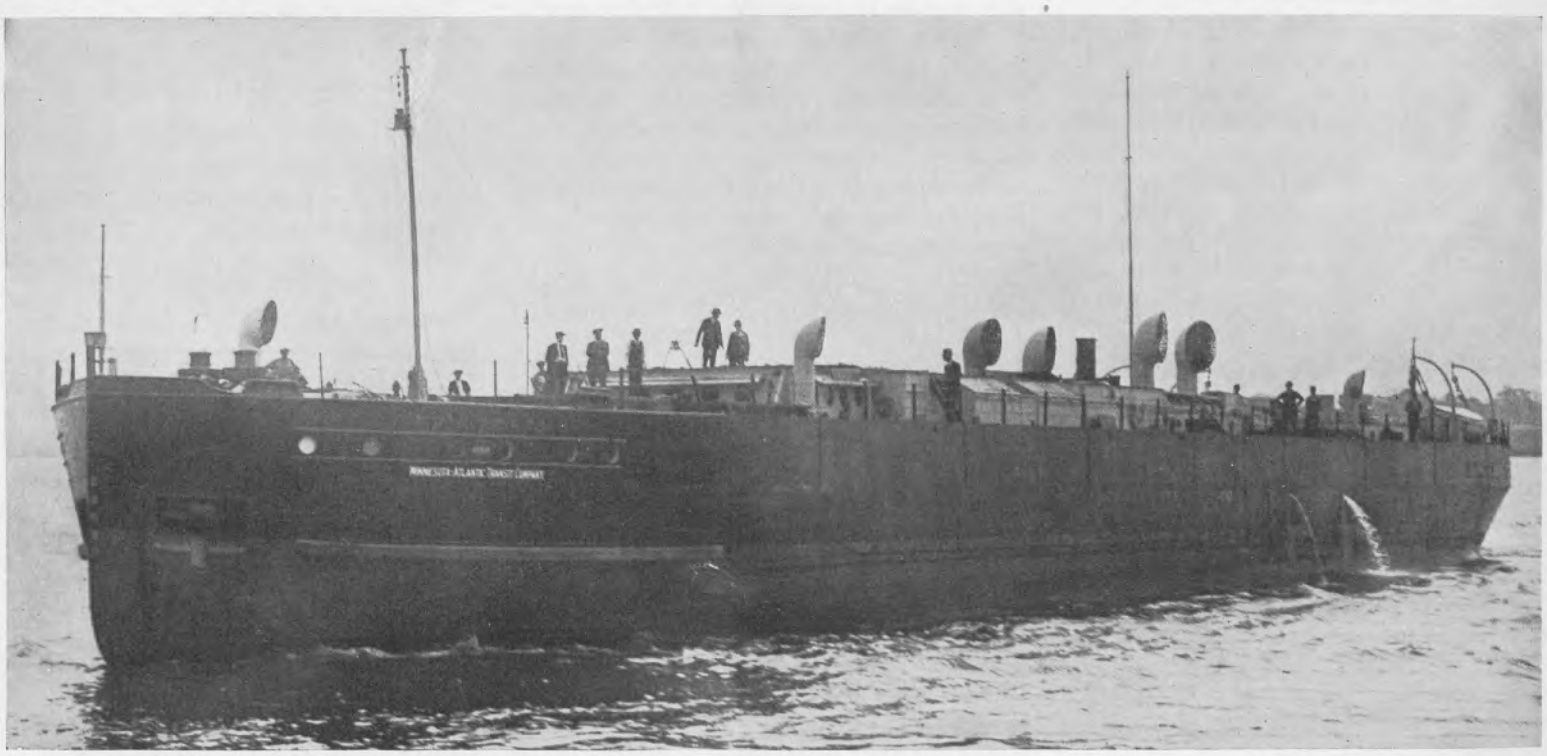
These two new Canal carriers, which bear the names TWIN PORTS and TWIN CITIES, have been built for the Minnesota-Atlantic Transit Co., which is owned by the McDougall Terminal Warehouse Co., of Duluth, a concern that operates an up-to-date warehouse at the big northern Lake port. A. Miller McDougall, president of both companies, is the son of the late Capt. McDougall, widely known as the inventor of the whalebacks and for many years a leader in marine developments on the Great Lakes.

Terminal and ships are associated in a broad general plan. The big warehouse at Duluth and the two Diesel-electric Canal carriers are only the beginning. The property owned by the McDougall-Terminal Warehouse Co. in Duluth is sufficient for the erection of three more warehouses of the size already erected, and more motorships will be built as the demand for freight space increases.

Owing to uncertainty about date of completion of the vessels, which were originally intended to be placed in service in June, there was no solicitation of freight until the TWIN PORTS left Ashtabula, O., about the middle of September. Nevertheless, inquiries have been sufficiently numerous and earnest to convince the owners that they will have no difficulty in filling the boats both ways when the regular service is started next year. It is too late in the season for much to be done this year, because the second vessel will probably not be in commission until about the end of this month, leaving at most six weeks before the close of navigation on the Great Lakes.

Unlike the other big Canal carriers, however, these two vessels have been constructed to meet the requirements of the coastwise trade and have been classed by the American Bureau of Shipping for that service. In the winter they will operate between New York, the Gulf Ports and West Indies where their usefulness will be greatly enhanced by the refrigerator space with which they are equipped. Of their total dead-weight-capacity at sea, which is about 2,600 tons, about one-fourth is available for refrigerated cargo.

The chilling arrangements are of the most up-to-date air circulation type. Two 4-ton Brunswick refrigerating machines are installed, the duplication affording a facility of temperature control which could scarcely be obtained with a single unit. As a measure of precaution against failure,



**That the new style Canal motor carrier has a hull not devoid of shiplike lines is apparent from this view of the *Twin Ports*. She has a bluff, flaring bow and a moderate overhang around the quarters and stern, but has no sheer. Without any raised forecastle or bridge or poop she does not look the part of the coastwise vessel that she will be when inland transportation is frozen**

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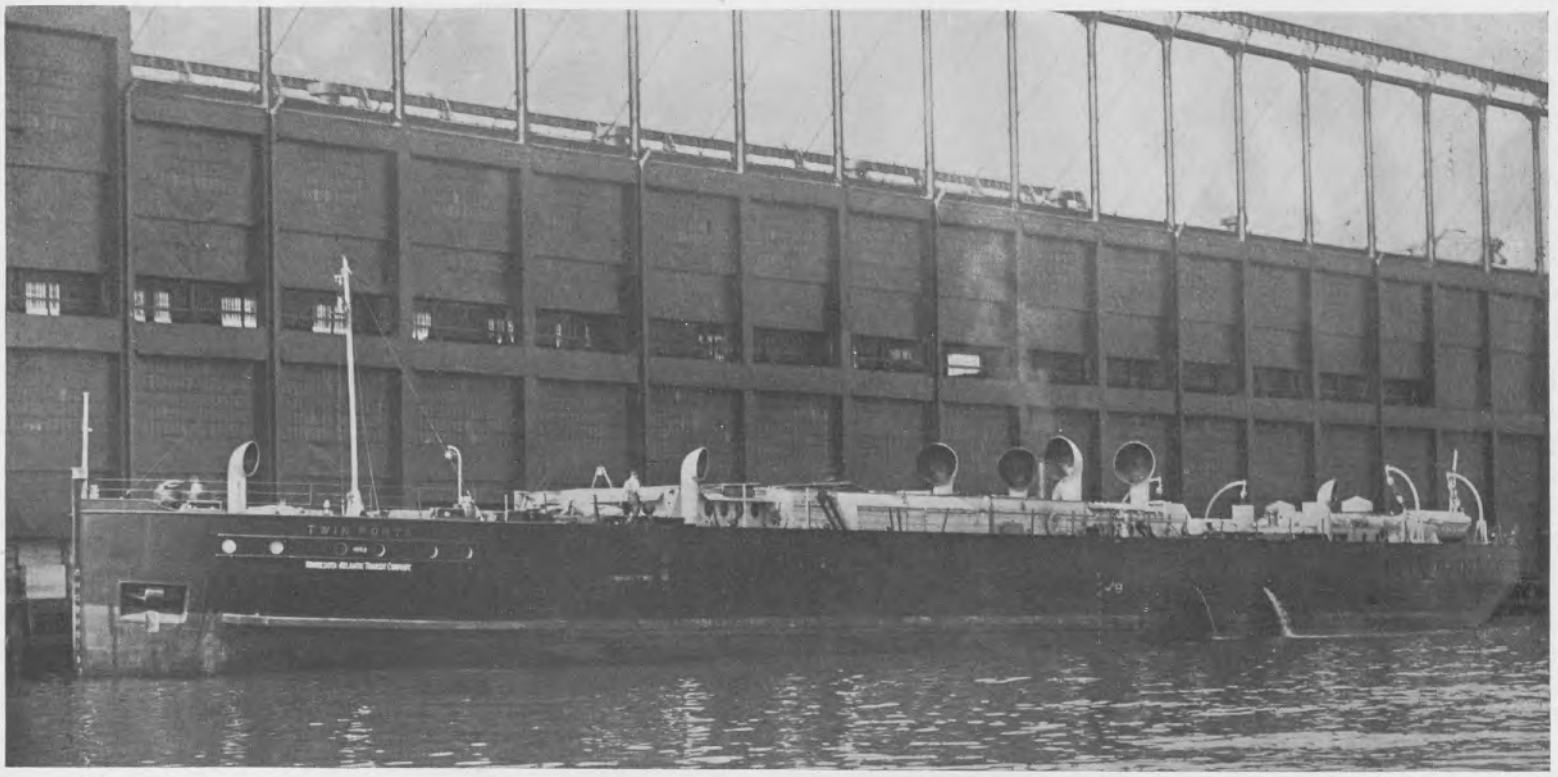
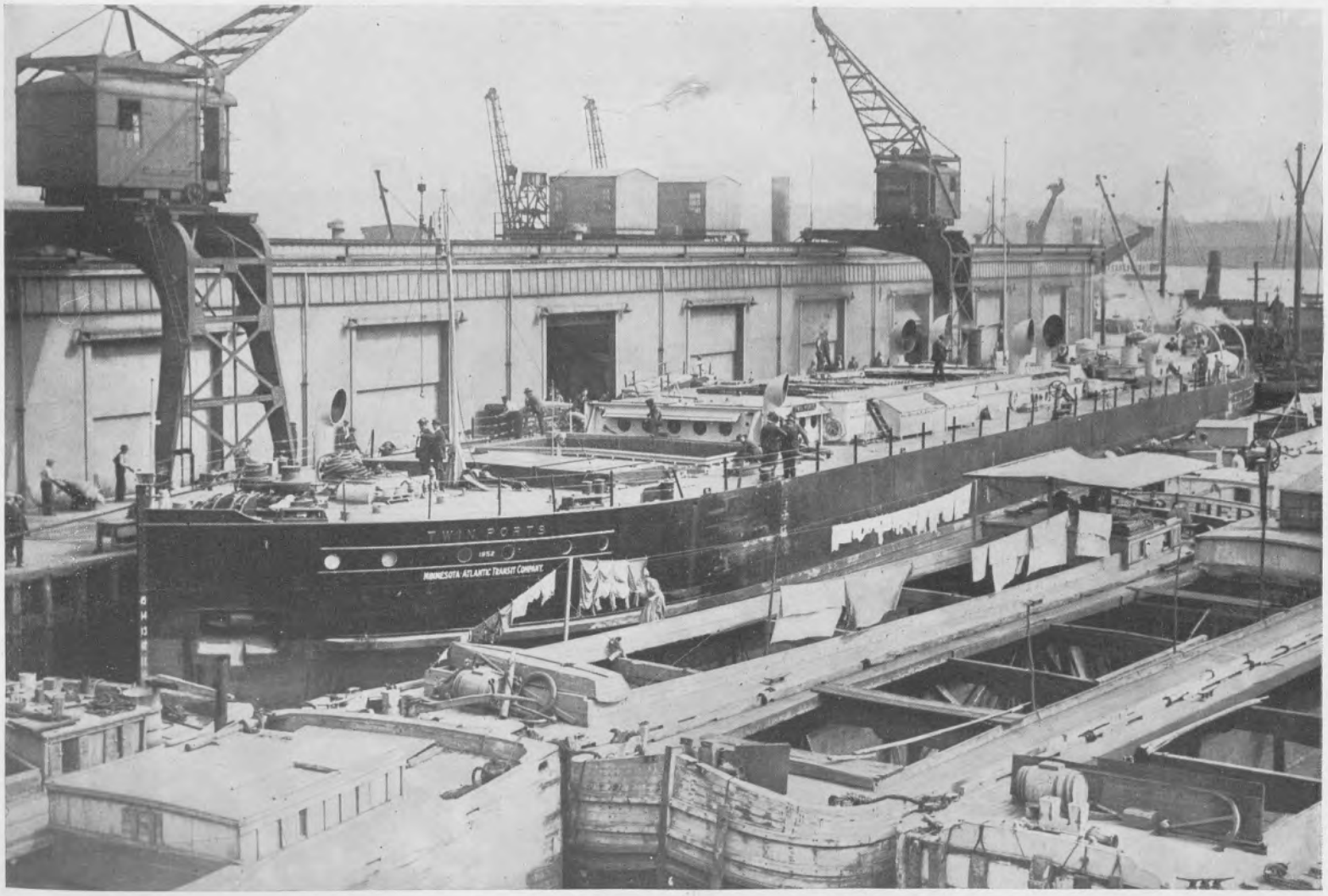


For vessels of this type, carrying a whole freight train load of merchandise from the Lakes to New York faster and more cheaply than the railroads can bring it, the people of the State of New York have poured out more than $100,000,000 on the reconstruction of the Barge Canal. The McDougall boats *Twin Ports* and *Twin Cities* are the first vessels to promise the Empire State an adequate return for the investment

the system of fans and ducts by means of which the air is circulated is also in duplicate. The air is first passed through chambers containing coils of brine pipes, which chill it to the desired temperature before it enters the refrigerator holds. For all manner of perishable cargo not in tight containers this system of air circulation is today regarded as the best.

In the Lakes and Canal trade the refrigerator holds will be used mostly for the carriage of dairy products, and in the coastwise trade will mostly be in demand for fruit.

After leaving Ashtabula, where she had been built by the Great Lakes Engineering Works and had her machinery installed, the TWIN PORTS went through the Welland




Only archaic wooden barges belonging to the era of De Witt Clinton have lazed around the Barge Canal Terminal, Pier 6, East River, New York, until the *Twin Ports* nosed her way in alongside the concrete shed and cargo cranes to make proper and rational use of facilities on which the State spent, at New York and other places along the canal, a total of more than $15,000,000

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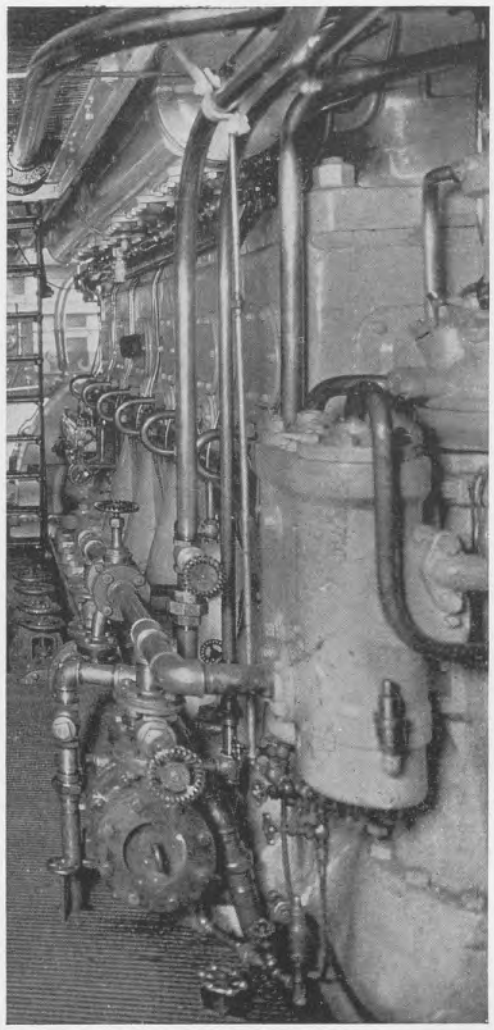
Canal to Lake Cntario and entered the New York State Barge Canal at Oswego. On the run through the Lakes in open water she made a speed which the Captain estimated to be about 10 miles per hour. She carried grain down to New York.

Between Ashtabula and New York, the main engines were operated for a total of 159 hours and the auxiliary engine for a total of 97 hours. During that period, which, of course, included a good deal of light running when the boat was passing through locks, the total fuel consumption was just short of 17 tons, equal to about 2½ tons per 24 hours' running time. The consumption on lubricating oil was about 30 gallons during the same time. These figures, it should be noted, indicate what her consumption will be approximately in mixed operation on the Lakes and Canal, but do not apply to coastwise service or to straight runs on the Lakes.

In the design of the two vessels the governing factors have been, firstly, the Welland Canal dimensions which are smaller than those of the New York State Barge Canal, and secondly, the headroom of the Barge Canal which is 15 ft., but unlimited on the Welland Canal. These factors have given a boat 258 ft. long, 42 ft. beam and 19 ft. depth, with a gross register of 3,000 tons and a dead-weight-capacity of 2,000 tons on the Barge Canal and about 2,600 tons in coastwise service.

The vessels present an unusual appearance. Having no deck structures, they look

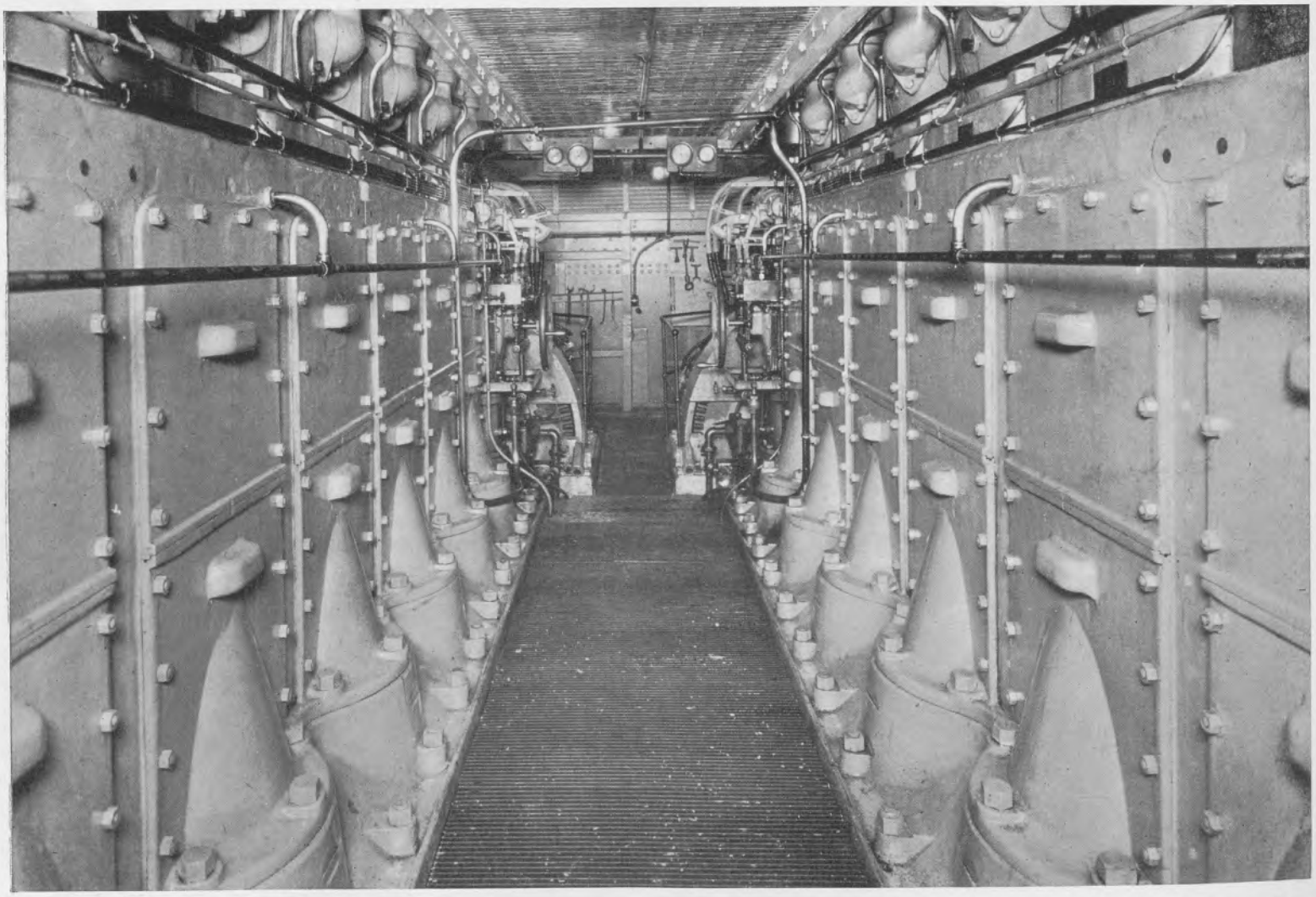


At the back of the main engines there is broad space for access to everything

something like Canal barges, but their ship-like hulls show at a glance that they are not ordinary Canal carriers. Such full demand has been made for cargo purposes on the maximum headroom of the Canal that when these boats are traveling light between the Hudson River and the Lakes they have to carry special short ventilators in place of the regular ventilator cowls, the masts have to be unstepped and the exhaust stack has to be lowered when passing under bridges, the latter operation being electrically performed by the touch of a button. The only breaks in the the flush deck are the hatch covers and the raised trunk of the pilot house, captain's quarters, engine-room and after accommodations, the top of all of which is little more than waist-high above the deck.

In the forward part of this casing is a roomy pilot house furnished with large porthole lights through which unobstructed view is given over the forward deck, on which the only standing object is a duplex vertical electric winch built by the American Engineering Co., of Philadelphia.

In the pilot house full control is given over the maneuvering of the vessel. The pilot has two levers which, by means of remote control switches, regulate the operation of the twin electric propelling motors. He takes no account whatever of the functioning of the Diesel engines or generators. With a quartermaster at the wheel carrying out the helm orders, the pilot can maneuver the boat at will, obtaining full



A wide alley-way between the two main engines gives ample room for inspection of the engine parts inside the crank housing. This view is looking towards the generator end of the engines

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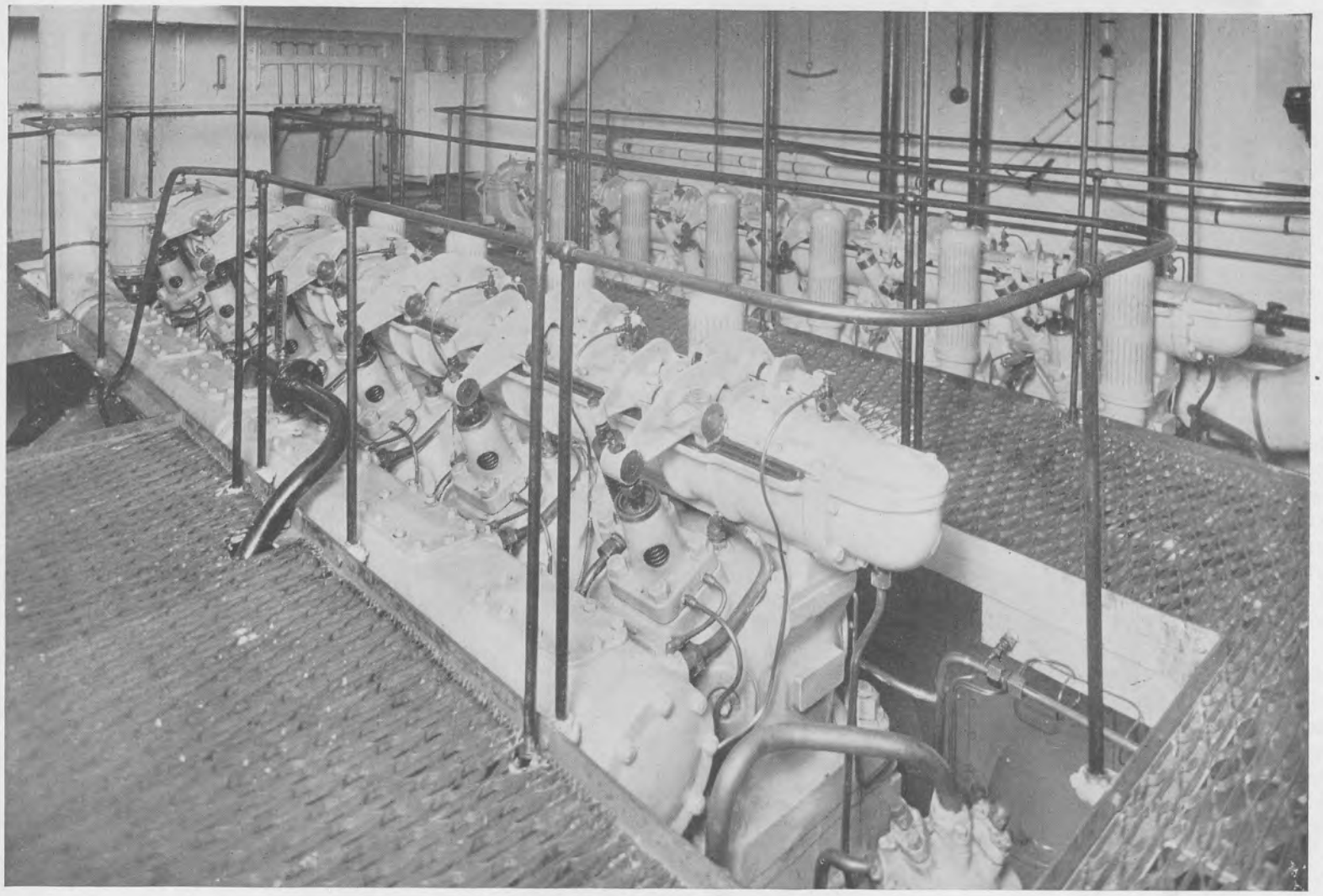

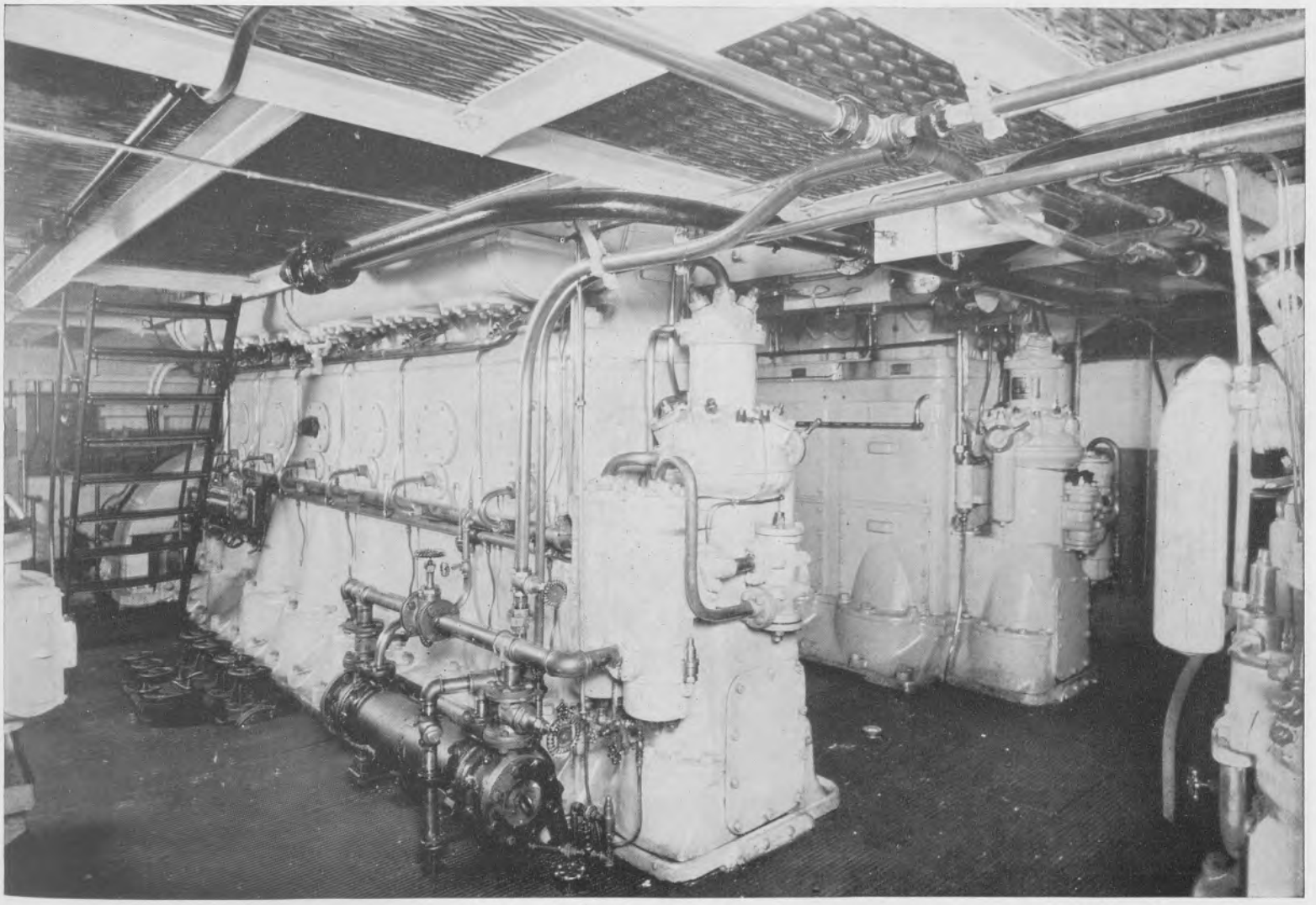

With ample headroom for the rangiest engineer and bodyroom wide enough for two corpulent men to pass each other anywhere in the engine room, the layout of *Twin Ports*' machinery represents an excellent study. In the lower picture are the main engine sets as seen on the floor, and in the upper illustration the two sets as seen on the grating

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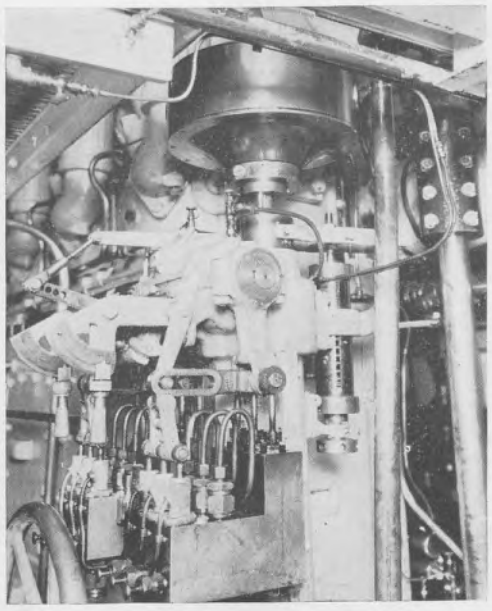
or half ahead or astern without any such delay as inseparably occurs when orders have to be transmitted to the engine-room. This electric control of the pilot house affords a certainty and precision of maneuvering, which is invaluable when working through Canal locks and is at all other times a great convenience and safeguard in navigating the vessel.

In order to picture what takes place in the engine-room while the pilot is maneuvering, one should consider himself standing near the main switchboard and Diesel sets in the engine-room. The engineer on watch does not have to stand by the engines or give them any more attention than is required during their normal operation. As the pilot moves the control levers, the ammeter needles on the switchboard flick between 0 and 450 amps. as the load is thrown on and off instantaneously. The whole burden of this control falls upon the governors and fuel pumps, the highest precision of operation being required from both in unison.

In the Lombard design of engine the Massey governor is mounted right over the fuel pump group, with the shortest possible connection between the governor arm and the regulating lever of the pump. So remarkably are these co-ordinated that when the TWIN PORTS is backing and filling the movements of the governor arms are as certain and as positive as any lever motion can be. There is no trace of hesitancy or of hunting, the engines keeping the same steady speed all the time. This after all might have been expected in the engines built by the Lombard Governor Co., which, even though it does not build oil engine governors, has had a long experience in the construction of water wheel governors that are reputed to be the best made. This precision of control under the extreme changes of load is a great credit to the makers of the Massey governor and to H. Schreck, who has been responsible for the fuel pumps and the refinement of the Lombard engine design.



**A sensitive and accurate governor is fitted to the main engines to take care of the instantaneous changes of load from full-power to no-load when the pilot is maneuvering the ship**

In a large and commodious engine-room there has been obtained an excellent machinery lay-out. The two main generating sets consist of six-cylinder Lombard Diesel engines turning at 260 r.p.m., direct connected to General Electric 250 k.w. generators. With a cylinder diameter of 13 in. and a piston stroke of 19½ in., each of these engines develops 375 b.h.p. at its rated speed. They are totally enclosed, built upon a solid base plate, with a box type crankhousing in two sections, and the cylinders bolted down separately. At one end the engine bed and crankcase of the compressor are formed integrally with the main engine structure. An overhead camshaft has been adopted, located directly over the center line of the cylinder heads, thereby freeing the engine from any operating mechanism at back or front and giving it a very clean and straight appearance.

There are a number of features in the engine that call for attention, and it will perhaps serve better to make them understood if some general remarks about the advantages thereby obtained are first referred to. Accessibility has been regarded as a very valuable feature, and special means have been taken to furnish it in the fullest possible measure. Efforts have also been made to keep down the weight, not through cutting out material where it was needed, but by rendering the engine compact and thereby cutting out weight that was merely incidental and useless. The engine design also bears the earmarks of a careful study from the production standpoint, particularly with a view to carrying the group assemblies to a very advanced stage.

Although this engine is of the trunk-piston type, it is not necessary to lift the cylinder heads in order to inspect the pistons. This inspection can be made through the crankcase. To achieve this purpose, the cylinder-head casting is made in one piece with the upper part of the cylinder, and a skirt is attached to the lower part of

Instead of ringing orders down to the engine-room the pilot on the *Twin Ports* controls all ahead and astern movements directly with his own hand by means of two levers which regulate the operation of the twin propelling motors. There is no room for misunderstanding of orders and no delay in carrying them out. This is an immense advantage of the Diesel electric system in berthing a ship in Canal locks or at a pier

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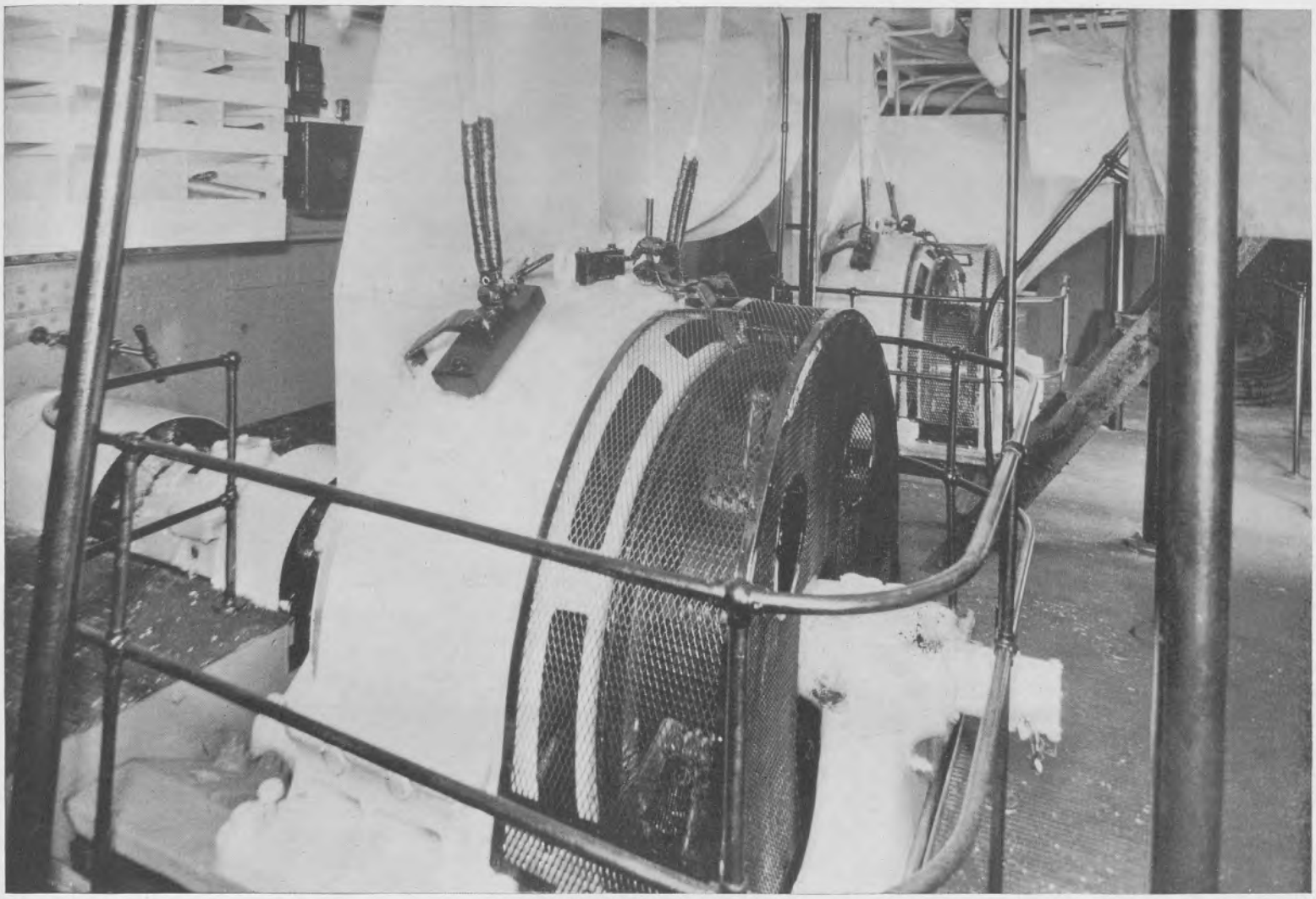

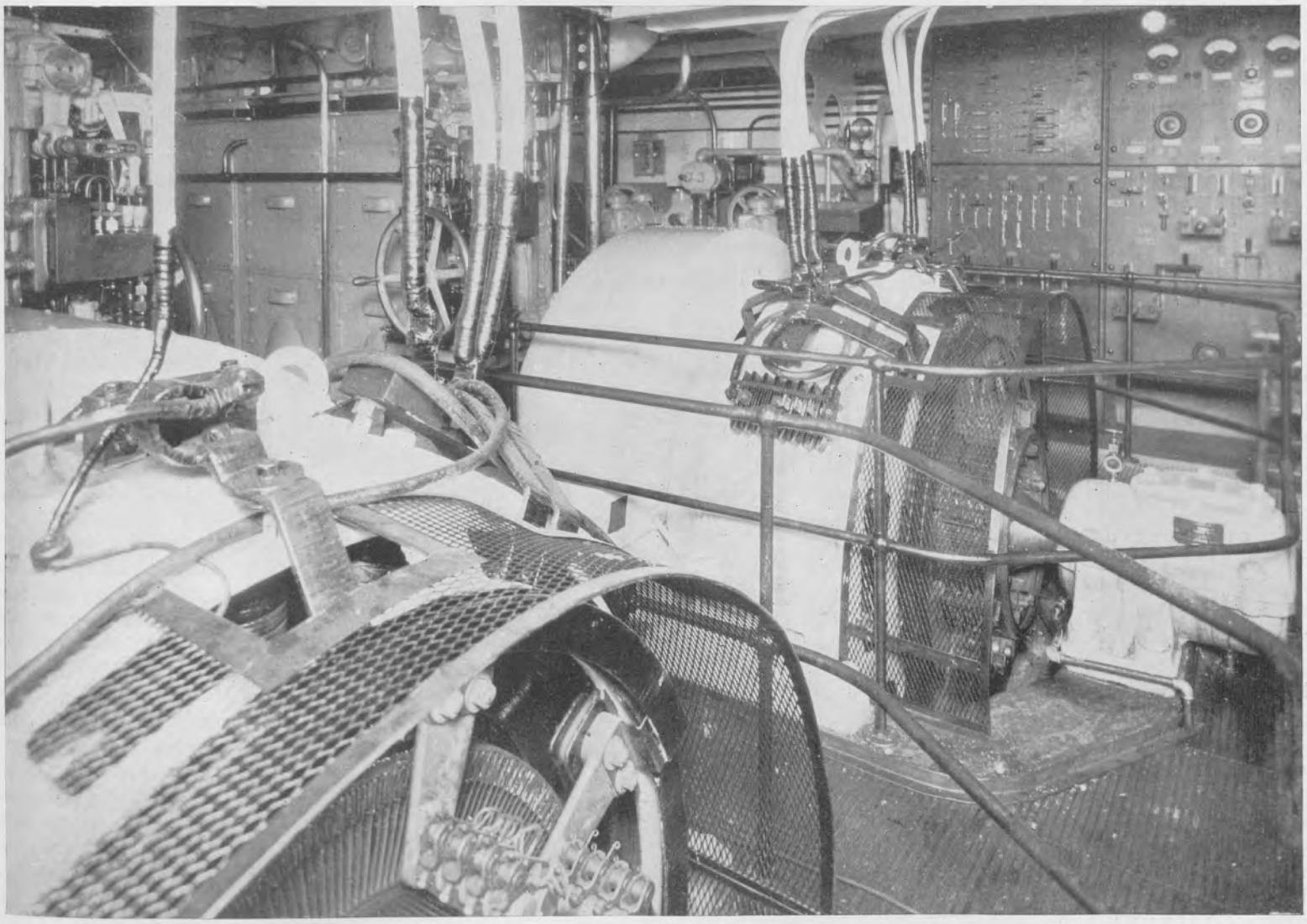

In the lower picture one may note the flywheel casing between engine and generator, the thrust-block on the outboard end of the shaft—refer to article—and the safety protection to all exposed parts. In the motor-room, pictured in the upper illustration, the space is not cramped

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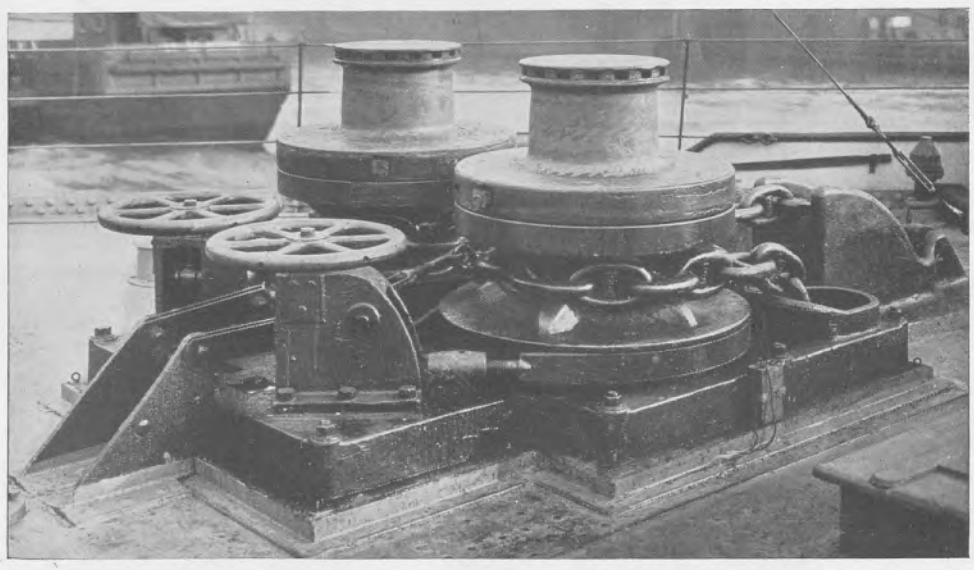
the casting to form the bottom end of the cylinder. For the inspection of the piston this skirt is removed, and when the corresponding crankpin is at bottom dead center the piston and connecting rod can be swung out through one of the large openings in the crank-housing normally covered by a door. There is an advantage in this type of design additional to the accessibility that is provided, namely, there is no high-pressure joint to be made between the cylinder and cylinder-head. The skirt joint can be subjected only to exhaust pressure and temperature and is, therefore, not a difficult joint to make.

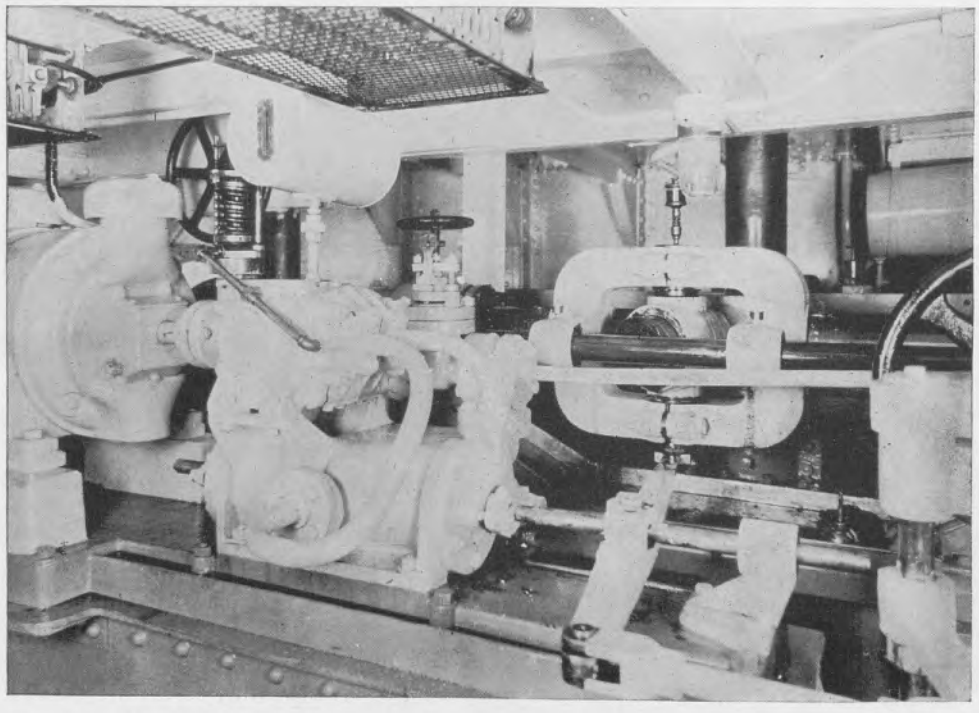
The absence of extra metal thickness, due to the avoidance of any combustion chamber joint, assists in the cooling of the hottest part of the cylinder and moreover gets rid of the contraction and expansion stresses that would otherwise be present. To relieve the crank-housing from the combustion pressures, there are long through bolts from the cylinder heads to the webs of the base plate. Their use saves weight in the crank housing and permits the width of the engine to be reduced to a minimum. In the cylinder-head there are the usual four valves of the four-cycle engine and a relief valve. These are disposed with the inlet valves and exhaust valves at about 30 degrees from the vertical, the combustion chamber head being domed for this purpose. The starting valve and fuel valve are both vertical.

Lying right along the top of the engine in an oil bath the camshaft can operate the valves through very short rockers. These rockers are just so much lighter for being short, and this assists in quietness of operation. Although these engines turn at a speed of 260 r.p.m. they are relatively very quiet, due in a large measure to the reduced clatter of the valve rocker operation.

McDougall Diesel-electric boat just out of the lock on the N. Y. Barge Canal at Amsterdam, N. Y., on her maiden trip from the Lakes



A duplex vertical electric windlass has been installed for anchor hoisting



A modern electric hydraulic steering engine makes the rudder respond instantaneously to the quartermaster's movement of the wheel in the pilot house

On one side of the cylinder-heads are the air intake mufflers and on the other side the water-cooled exhaust elbows and manifold, discharging into a couple of Maxim silencers in the top of the engine-room casing. The exhaust pipe and silencers are unusually well covered, with the result that one does not notice any increased temperature in the engine-room.

The compressor is of the steeple balanced three-stage type, with low pressure and intermediate pressure coolers in an outside box and the high pressure cooler in the jacket of the h.p. cylinder.

An unusually good lay-out of water piping and oil piping has been made, and the pipe work bears the character of unusually good workmanship. The main water supply runs along the middle height of the crank housing with a separate elbow to the jacket of each cylinder. Another lead is taken to the exhaust manifold, thence the water flows to the heads and exhaust valve caps. The cooling water, before passing to the engine, is taken through the oil coolers, and the oil feeds to the engine are taken along a manifold parallel to the water supply pipe.

The lubricating oil gear pump, which is under the compressor, feeds the oil at 10-12 lbs. pressure through separate lines to each main journal, then through the drilled crank webs to the crank pin journal and up a tube to the piston-pin. The cylinder oil feeds are very neatly carried along under cover of the cooling water pipe so that they are scarcely noticeable. Separate oil feeds are fitted to the camshaft bearings. All the lubricating oil in circulation through the

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engine system is constantly being cleaned in a Richardson-Phenix oil filter tank, a by-pass from the oil pressure line leading direct to the filter, so that part of the oil is always undergoing purification.

Nearly all these various details of design to which references have been made, can be seen in one or other of the machinery illustrations on the accompanying pages, practically the only feature not visible being the detachable cylinder skirt.

At the flywheel end of the engine the drive is taken off both for the camshaft and for the fuel pumps. It is at this point that the most uniform turning movement of the shaft is available, and it is, therefore generally considered the best location for the fuel pump drive. In this case the maximum benefit is derived from the location by using a separate shaft for the operation of the fuel pump group, another shaft being used for the camshaft drive.

These pumps are designed on the orthodox Diesel engine principle, with regulation on the suction valve side of the pumps, but there is a very wide latitude for the designer's talent even when the orthodox style of pump is used. The way that the engine responds to the governor movements shows that the Lombard fuel pumps are of unusually good design. They are divided into two groups of three each, the entire mechanism of each group being assembled in a machined steel block. One of the illustrations shows them very clearly.

A big hand wheel situated at convenient height, right under the fuel pumps assembly, serves to control the air starting and fuel valves, which are interlocked in the usual manner so that both sets cannot be in operation at one time. Just above the hand wheel, right over the pumps, are the two handles controlling the fuel feed when starting, there being one lever for each group of three cylinders. By means of an ingenious unlocking device these hand controlled levers can be entirely disconnected from the pumps when the engine has been started, so that the fuel speed is regulated solely by the governor operation, the engines being designed to turn constantly at 260 r.p.m. in order to maintain a uniform voltage.

Between the engine and dynamo of each generator set there is a heavy flywheel completely encased, and around the generator is a guard rail. Outboard of the generator is a Kingsbury type thrust-block which takes care of any axial motion on the crankshaft due to the rolling of the vessel. The engines are installed athwartships for economy of space, there being no reason to place them fore and aft, because there is no mechanical connection between them and the propeller shafts.

A three-panel switchboard is mounted on the same side of the engine-room as the generators. On it are the generator, switches and the electrical instruments, together with switches of the different electrical circuits. The main motor switches are in a separate motor room aft. Besides the main generators there is also an auxiliary dynamo, which is of 40 k.w. capacity, direct driven by a two-cylinder Lombard Diesel engine with cylinders 9½ in. by 13½ in. and operating at 360 r.p.m., the rating being 60 b.h.p. This can furnish current for the lighting of the vessel and for all auxiliary purposes aboard the vessel. It is intended to operate when the main sets are shut down.

For emergency purposes, such for instance as when the vessel is undergoing an overhaul, there is a separate 5 k.w. generator set, operated by a small Winton kerosene engine. The emergency compressor is also of Winton construction. It is of the two-stage type, driven by an electric motor. The pumps in the engine-room comprise a main circulating-water pump serving all the engines, an emergency lubricating oil pump, a fuel oil transfer pump, a duplex general service pump and a rotary pump for the oil and ballast tanks, all being electrically driven. There is also a hand operated fuel-oil transfer pump. Fuel oil is stored in the double bottom and there are daily tanks in the engine room.

This vessel, being designed for electrical operation is, of course, provided with electric steering gear, which has been built by the Hyde Windlass Company with Waterbury control. As can be seen in one of the illustrations, the steering engine is of the electro-hydraulic type. The real difference between it and a steam hydraulic type is that the steam driven pump is replaced by a variable-stroke rotary oil pump, driven continuously in one direction by an electric motor. The same kind of follow-up control mechanism is used, but it operates the control shaft of the oil pump instead of operating a hydraulic reverse valve. The great advantage of the electro-hydraulic steering gear is that it dispenses with the need for maintaining a continuous high fluid pressure to operate the rudder under any conditions, and this explains why it is considered advantageous to use a continuously rotating electric motor in connection with the variable stroke oil pump.

For the general service of the ship electricity is used throughout. The quarters are heated by electricity, the water supply is electrically-heated, the galley range is electric and in fact everything is so contrived that neither coal nor oil burners are installed for any purpose whatever. At first even the whistle was operated by an electric motor, but this was found to present certain disadvantages and an air whistle has now been installed.

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Last month the new Diesel-electric vessel La Playa, which has been built by Cammell Laird & Co. for the United Fruit Co., of Boston, successfully completed her official power and speed trials on the Clyde, the preliminary trials having been made on the Mersey. La Playa is the first of three sister ships of a new type, the other two which are still under construction at the Birkenhead yard being named La Marea and La Perla. All three vessels are 325 ft. in length, 48 ft. in breadth and 31.7 ft. depth, with a gross tonnage of 3,830. The propelling power in each ship is in four generating units, each consisting of a four-cylinder Cammellaird-Fullagar opposed-piston Diesel engine direct connected to a generator supplying continuous current at 220 volts. These sets turn at 250 r.p.m. but the propeller speed is much lower. The boats have been specially designed for the carriage of fruit in refrigerator holds and have a sea speed of 14 knots. All the electrical machinery has been furnished by the British associates of the General Electric Co., of Schenectady, N. Y.

## Henry Ford Will Order Motorships for the Great Lakes

Vessels of about 14,000 tons carrying capacity and about 600 ft. in length, propelled by Diesel engines, are to be ordered early this month by Henry Ford, for the transportation of ore from the Upper Lakes to his big furnace plant at River Rouge, near Detroit. We have been instructed by the Ford Motor Co. that the size and make of engines has not yet been decided upon. These ships will be of the largest Lake size. Owners of tonnage on the Great Lakes have always said it couldn't be done. Henry Ford is going to show them it can be done.

An order is to be placed very shortly for several Canal carriers of the Troy Socony type, carrying 1,800 tons of cargo. The Standard Transportation Co. has taken bids for six vessels of this size for service on the Barge Canal and Great Lakes during the navigation season and to be used on the New England run during the winter. These boats are to be equipped with two engines of 300 b.h.p. each.

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A Diesel-electric tug of 800 b.h.p. is to be ordered by the Marine Department of the Pennsylvania Railroad Co., for service in New York Harbor.

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Bids for Diesel-electric ferry boats will be called for by the Department of Plant & Structures, New York City, in about one month or six weeks.

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Mr. T. Orchard Lisle, Editor of Motorship, will return to his office about the end of this month after a four months' investigation of motorship progress in Europe.

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MOTORSHIP

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## The New Motorship Fleet on the Great Lakes

A DEVELOPMENT destined to impress its influence on all American Shipping is crystallizing on the Lakes, where four new motor vessels that made their debut this season are to be joined next year by Diesel-engined ore carriers of the largest size. This new motor tonnage presages the change in Lake shipping that the oil engine long ago began to make in ocean transportation. The economy of the Diesel engine is irresistible, and no combination of forces can prevail against its ultimate supremacy wherever ships float.

Henry Ford, this country's leading apostle of economy in all business operations, will be ordering this month Diesel-propelled ore carriers of the largest dimensions that can pass the locks at the Soo, vessels about 600 feet in length and of about 14,000 tons cargo capacity. A premature announcement appeared on the first of this month in some of the daily newspapers. The published statement was correct in substance, if not in form, because the decision had already been taken to order the vessels, although the contracts had not been signed. A few details still remained to be settled.

Ford is in the coal business, as mine-owner, operator and coal merchant. He can deliver coal over his own railroad to the dock at his River Rouge plant, where the boats will discharge their ore, at as cheap a price as any of the Lakes shipowners can buy their coal, not excluding one. Nevertheless, he passes up steamers and decides on motorships. Is it not clear that he is convinced the Diesel-engined vessels will be cheaper to operate? Yet all the other men in the ore-carrying business ridicule the idea that any type of ship can be cheaper to operate than the steamer. Whence the difference? An open mind, of course.

It would be unlike Ford not to burn coal tar oil in the engines. At the River Rouge plant he has a by-product coke plant, in which tar oil is recovered from the ovens by the low-temperature process of distillation. It is not in his code of economics to waste coal in boiler furnaces, when he can use it to so much greater advantage by coking it first for the blast furnaces and giving the by-product oil to the boats. Nor is it in line with his conception of business economy to burn that same oil in boiler furnaces when he can get three times as much power from it in Diesel engines.

This subject has been studied by the U. S. Steel Corporation, which owns about 100 vessels on the Lakes and about 35 on the ocean, and there can be little doubt that its first two motorships, *Steelmotor* and *Steelvendor,* which are described in this issue, are trial horses, from experience with which they will be led to increasing adoption of the oil-engined vessel. With the inclusion of the interesting article on the operating costs of the m.s. *Fordonian* and the description of the new combination Lakes—and Canal—carriers, *Twin Ports* and *Twin Cities,* this number of the MOTORSHIP is designedly a Great Lakes Issue, to be studied and filed by those whose fortunes lie with Great Lakes Shipping and to be weighed and considered by all who fly the American flag at sea.

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## Balancing Costs of Operation on the Right Side

STRIKING comment on the value of the motorship under present shipping conditions was made by The Look-out Man in a September issue of *Fairplay,* which is as ably conducted today by Gordon H. Robinson as it was by his father who founded it over 40 years ago and made it a power in the shipping world. *Fairplay,* true to its name, has always given the motorship a fair showing, right from the trials of the *Selandia* in 1912, when the skepticism of The Look-out Man was of the deepest hue. Even today that dean of shipping magazines still manifests a preferred sentiment for steam, but this only renders its comment on motorships more valuable. This is what The Look-out Man wrote:

"It is in times like the present that the shipowner realizes the advantage of possessing the most up-to-date vessels. Some owners who fitted their steamers for burning oil instead of coal, in order to save expense in running, have found that in certain trades the advantage is still with coal, but those owners who have had the courage to adopt Diesel engines seem to have profited by their enterprise. It is reported, for instance, that a well-known firm which acquired a Diesel-engined vessel some time ago have been quite satisfied with the trading results they have obtained so far, which would have been impossible with a steamer. This vessel recently completed a round voyage which occupied over 160 days, and the accounts show that for the period she has netted an average profit of about £4 per day, which does not seem a very satisfactory result considering the increased cost of the vessel, but is really a remarkable performance when a similar voyage is worked out with oil-burning or coal-burning steamers of the same size. If she had been an oil-burning steamer she would have had to shut out cargo to the extent of 6.05 per cent., the receipts being reduced by this amount, the insurance would have cost about £1,000 less owing to the smaller value of the vessel, and with less cargo the disbursements at the various ports would be lower, but as against this the cost of the oil fuel would be 146 per cent. greater, the net result of the voyage being a loss of over £3,000, representing about £19 per day.

"The results of the steamer burning coal are even worse. Owing to the large amount of coal to be carried, thus reducing the cargo capacity, the gross freight would be 9.61 per cent. less than with the Diesel boat, and the disbursements at the various ports slightly less than with the oil-burning steamer, but the cost of the coal would be over £3,000 more than the oil for the oil-burning steamer, and nearly £7,500 more than the oil for the Diesel boat, with the result that her round voyage would show a loss of about £7,400, or nearly £47 per day, against a profit of £4 for the Diesel boat. These figures, which I have reason to believe are to be relied upon, show that, whereas the coal-burning steamer would lose at the rate of £17,000 per annum, and the oil-burning steamer £6,935 per annum, the Diesel boat would show a profit at the rate of £1,460 per annum, which, of course, takes no account of depreciation and interest on capital. It is true that the Diesel boat costs considerably more than the steamer, but, if the above figures afford any criterion of the relative earnings of the boats on other voyages, the Diesel boat more than justifies her extra cost."

It is a small matter that the figures are expressed in pounds sterling instead of dollars. The weight of the facts would remain unaltered even if the figures were given in German marks. The outstanding point is that *with the motorship money comes into the owner's pocket at the end of the voyage instead of going out as it does with the steamer.*

The man who owns a steamer can't get away from "de ducks" any more than the colored farmer could. When the Texas darkie called on the bank manager for a loan the latter expressed surprise. "I thought you were on easy street after selling your onions," the banker said; "how much did you get?"

"De ducks got 'em," replied the onion grower with an air of finality, as if that explained all.

"What do you mean? Couldn't you ship any onions? Did the ducks get them all?" pursued the banker.

"Yessah, de ducks got 'em all," repeated the darkie.

"How was that?" enquired the banker with curiosity.

"I jes shipped de whole crop," said the colored farmer sorrowfully, "and de broker wrote me: By sale of onions, so much; de duck for freight, so much; de duck for insurance, so much; de duck for storage, so much; de duck for commission, and so on. De ducks got 'em all."

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# Interesting Notes and News from Everywhere

### M. S. Ashbee Runs First Trials

A very successful 4-hours' trial was made by the m.s. ASHBEE on September 27th. It was the first time the ship had left the pier since her conversion, and opportunity was taken during the last two hours of the run to operate the new Diesel engine at its full designed power. Converted from steam by the New York Shipbuilding Corp., of Camden, N. J., this vessel has been equipped with a 2,000 i.h.p. Werkspoor type of engine turning at 110 r.p.m. The engine-room auxiliaries are now electrically operated, but the original steam winches and anchor windlass have been retained on deck. The main engine runs with remarkable smoothness, and the entire ship is at all times much freer of vibration than she ever could have been as a steamer. A little more work still remains to be done aboard her and since the work is not being rushed the ASHBEE will probably not be finished up until the latter part of October. The conversion was undertaken with the double purpose of affording Diesel engine experience to the engineering staff at Camden, and of providing work at these yards, and the vessel has not yet been sold.

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Two 2,500 h.p. engines for the BINTANG have been ordered from Sulzer Bros., Switzerland. This vessel, which was built in 1916 for the Stoomvaart Maatschappij Nederland, is 417.7 ft. in length h.p., 54.5 ft. beam and 33.6 ft. in depth. She registers 6,548 tons gross. Originally she had steam machinery, with twin-screw triple expansion engines, which will be removed by the Amsterdam Dry Dock Company, when she is converted into a motorship. The same owners are planning to order a new motorship before very long.

*World's Record of New Construction, Ships' Performances and Other Matters of Note*

### S. S. Python to Be Converted

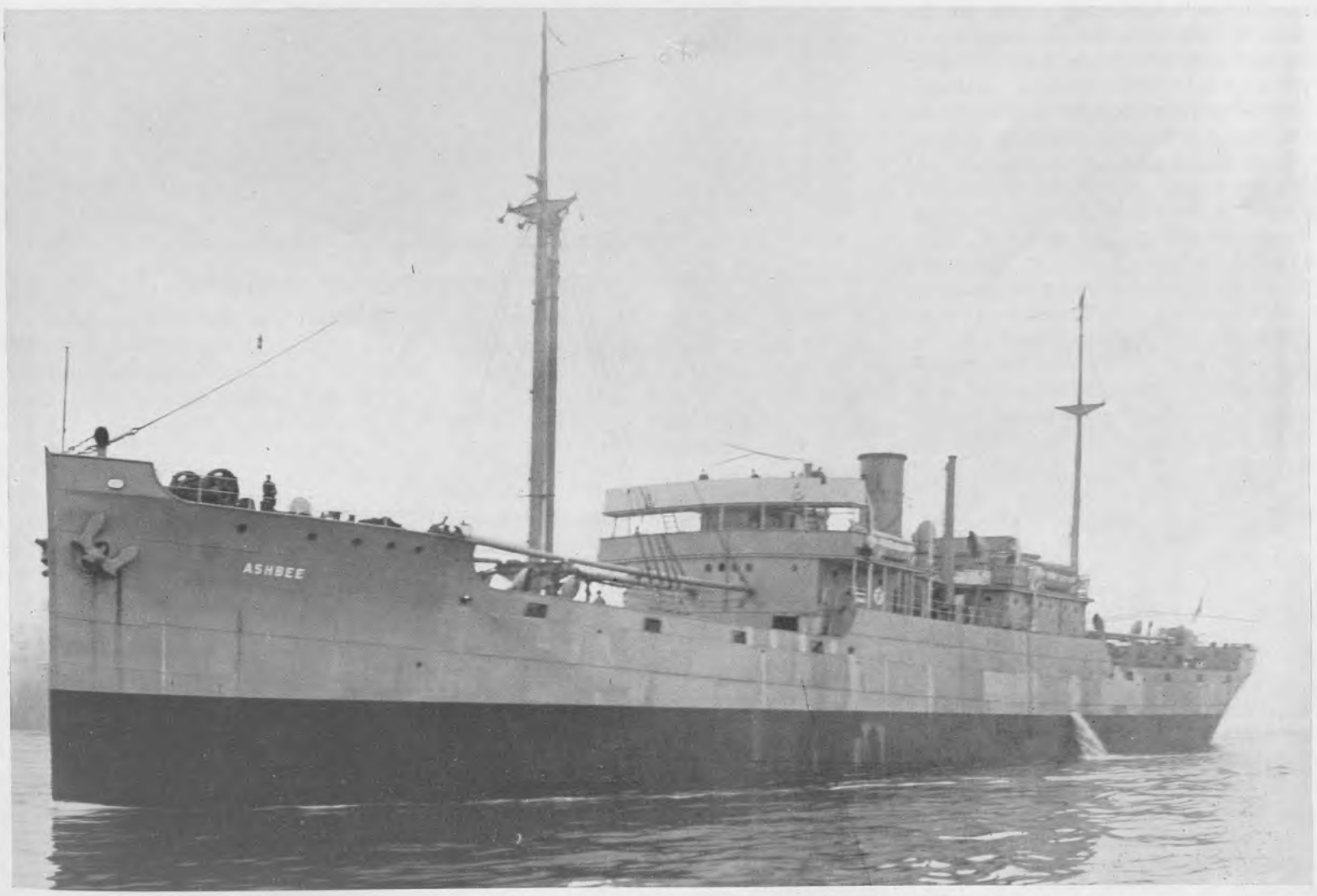
A Great Lakes type of steamer, built by the Manitowoc Shipbuilding Company in 1919, has been purchased from the Shipping Board by the O'Boyle Lighterage Company, of New York, for conversion to motor power. The owners state that they will install a McIntosh & Seymour engine of 750 b.h.p. and the conversion work will probably be carried out at one of the yards in New York harbor. This ship measures 2,153 tons gross, and is 250 ft. 6 in. long, 43 ft. 8 in. beam and 20 ft. 1 in. deep. She can carry 3,400 tons d.w. on a draft of 19 ft. After reconstruction, she is expected to make a speed of about 9 knots.

### Converting a Long Island Sound Boat

Used for freight and passenger service between New London, Conn., and Fisher's Island, the S.S. MUNNATAWKET, owned by the Fisher's Island Navigation Company, is now undergoing conversion to Diesel power at the Groton Works of the New London Ship & Engine Company. Her measurements are: length overall, 117 ft. 0 in.; beam, 22 ft. 4 in.; and draft, 8 ft. 6 in. The gross tonnage is 204 and the net 102.

Her present 300 i.h.p. steam engine will be removed, and a four cycle eight-cylinder 240 b.h.p. directly reversible Nelseco engine installed.

A considerable increase in cargo space will result from tearing out the boilers, which at present are in a very undesirable location as regards freight-carrying capacity. Due to compactness in the engine design and the resulting low head room necessary, it will be possible to place all machinery below the lower or freight deck. With the Diesel equipment the boat will actually have more power and a better speed, because the efficiency of her steam engine and boilers had depreciated with age, as is so frequently the case. The hull being still in excellent condition, the owners will enjoy many years of satisfactory and cheaper operation with the economy of the oil engine.




At the end of September the motorship *Ashbee* ran a first and very successful trial on the Delaware River

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Capt. John Gilbert is taking the steam machinery out of his boat at Sandusky, Ohio, and installing a 200 h.p. Atlas Diesel engine. After her conversion, the boat will probably be used for towing in canal service.

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A new Diesel-engined tug is expected to be placed into commission at Portland, Oregon, early this month. She will be known as the JAMES W., and is 90 ft. long, 20 ft. beam and a depth of 5 ft. A 300 h.p. Atlas-Imperial engine has been installed.

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### Motor Tug Wins Pulling Contest

A novel tug-of-war was staged on Saturday, September 8th, on the Delaware River between the new motor tug HUSTLER, owned by the Diamond P Transportation Co., Philadelphia, and the crack steam tug CASPIAN, owned by P. F. Martin. The vessels were fastened stern to stern with about 200 ft. of strong hawser between, and then each crowded on all the power she could muster. For the first ten minutes it seemed to be a fairly even tussle, but the big oil engine gradually asserted her complete independence of steam pressures, firemen and coal passing, and soon had the steam tug going backward in spite of her best efforts.

The boats were then fastened stem to stem, and a backing contest followed. In this the steam craft had a little the better of it, which was to be expected owing to her larger diameter propeller and finer lines aft. The difference in backing power, however, was very slight, and should not be taken as an indication that the motor vessel is inherently deficient in this respect. The owners of the HUSTLER consider her backing power and manoeuvring and ability to handle heavy tows fully equal to that of any steam tug they have ever had.

The dimensions of the HUSTLER are: length overall, 82 ft. 6 in.; breadth moulded, 20 ft. 0 in.; depth moulded, 9 ft. 0 in. She is powered with a six cylinder Ingersoll-Rand oil engine of the moderate compression, airless injection type, having a cylinder bore of 13 in. and a stroke of 19 in., rated 320 b.h.p. at 250 r.p.m. On the test bed the engine pulled as high as 400 b.h.p. at the rated r.p.m., and it is probable that she was developing about this during the contest above described. The propeller is a four bladed Hy-Ten-Sl bronze wheel with a diameter of 6 ft. 3 in., a pitch of 3 ft. 9 in., projected area of 14.7 sq. ft. and developed area 15.9 sq. ft.

The CASPIAN is a somewhat larger tug having an overall length of 90 ft., a breadth of 21 ft. 6 in. and a depth of 11 ft. Her power is furnished by a compound condensing steam engine with a high pressure cylinder diameter of 15 in., low pressure 30 in. and a stroke of 22 in. During the contest the by-pass was open, admitting live steam to both high and low pressure cylinders and considerably increasing the power. The steam pressure carried during the contest was 125 lbs. and the r.p.m. 105. The propeller is of steel, diameter 7 ft. 4 in., pitch 10 ft. 6 in., and developed blade area approximately 32 sq. ft.

In the tug LISTO, owned by the Wilmington Transportation Company, a Diesel engine has just been installed of Union design and construction, built by the Union Gas Engine Company, of Oakland, Calif. The tug gave very satisfactory results on its trials.

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Another Diesel engine has been ordered by the Crowley Launch & Tug Boat Company, which has recently transferred its operations from San Francisco to Los Angeles. The new engine, which will be built by the Pacific Diesel Engine Company, is for the tug boat CHRISTOPHER COLUMBUS.

Work on the new passenger motor-liner AORANGI for the Canada-Australian service is proceeding satisfactorily but it is not expected that she will be completed before contract time, June of next year. It is understood she will be about 600 ft. in length and 73 ft. in breadth, with a depth of 41 ft., giving her a gross tonnage of about 20,000. It was recently announced in Vancouver that Capt. Robert Crawford in command of the steamship MAKURA of the same line, has been appointed to the new motorship, and will leave soon for Scotland to stand by the vessel until she leaves the builder's yard.

*Hustler* is a new tug recently commissioned in Philadelphia

### Notice to Tug Boat Captains

In the report of the official inquiry held in Hamburg into the loss of life caused by the sinking of the tug FAIRPLAY II while she was in attendance on the motorship DINTELDIJK, a warning is issued about the special care necessary when maneuvering small boats near the stern of a motorship. It is pointed out that whereas a steam engine only picks up speed slowly when reversed, a Diesel engine starts going astern at a considerable speed and churns up the water to a much greater extent. The accident in Hamburg seems to have occurred through the fact that the captain of the tug allowed his vessel to drift too close in towards the stern of the motorship and then it was suddenly drawn in by the suction of the propeller when the engineer of the motor vessel reversed the engine. The tug was badly damaged and sank with the loss of three lives. Notice of the special care required around the stern of twin-screw motorships should be served on all tugboat captains by the commanders of motorships.

### Diesel Tug for New London

The tug ALERT, owned by the Merritt-Chapman and Scott Corporation and operated in and around New London, Conn., will be converted to Diesel drive. A four cycle, 240 b.h.p. Nelseco engine will replace the present simple engine of 400 i.h.p. At first glance it would seem that the vessel would be underpowered with her new equipment. Actually, however, the oil engine will develop more horsepower and give a better speed than the craft had formerly. This is a concrete example of the tremendous loss in efficiency of old steam machinery. Few owners realize what this drop in economy will be when they purchase the obsolete steam engines. Furthermore, the Nelseco engine will weigh less and reduce the draft approximately 10 in. This will give the boat a better free-board, which formerly was too small. The ALERT which is 99 ft. 5 in. in length overall, 16 ft. 6 in. beam and 7 ft. 0 in. draft, with a gross tonnage of 99, will have her conversion made at the Groton Works of the New London Ship & Engine Co.

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With considerable refinement of details the new Washington-Estep Diesel engine is just about ready. The principle is the same and the changes have been made only in mechanical details.

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According to advertisements published in the western papers, the stock of the California-New York Steamship Company is being offered on the basis of one share Preferred and one share Common for $150. The capitalization is fifty thousand shares of 8 per cent. cumulative Preferred, par $100, and seventy-five thousand shares, no par value, Common.

A Pacific coast passenger office has been established by the United American Lines at 230 California Street, San Francisco, according to an announcement made by Mr. Emil Lederer, vice-president in charge of passenger traffic. The new office opened September 1st, and has jurisdiction over the Pacific coast territory of the United States and Canada. The acquisition of the steamship CLEVELAND by the United American Lines and the addition of the new Hamburg-American Line steamers ALBERT BALLIN and DEUTSCHLAND are responsible for the establishment of this new office in the interest of the joint service maintained by the two companies.

**This motor tug *Czar* has just been converted from steam at Vancouver, B. C.**

### Motorship Isis

Another line to place motorships on the run from European ports to the Pacific coast of America via the Panama Canal is the Kosmos Line, of Germany, which in September had the ISIS calling at ports as far north as Vancouver, B. C. The ISIS was put in commission in September, 1922, and previous to coming on the trip to American Pacific Coast ports and British Columbia, had made several voyages to South American ports. She was built by the Deutsche Werft, and her Burmeister & Wain four-cycle engines were built by the A. E. G., Berlin. A steel vessel, 376.2 ft. b.p., 51.8 ft. moulded breadth, 25.9 ft. moulded depth and of 7,100 tons deadweight capacity, she has twin screws driven by engines of 1,260 shaft h.p. each at 125 r.p.m. which give her a speed of 11.7 knots loaded. Her chief engineer states that on the trip out at 11.7 knots average speed her fuel consumption was a little under 10 tons a day. She has two Diesel auxiliaries, and the deck machinery is electric providing the best economy for loading and discharging.

Although at one time during the summer it was thought that the Hudson Bay Company's auxiliary schooner LADY KINDERSLEY, might winter in the Arctic, she is reported now to have passed out through Bering Strait, with the richest cargo of furs ever brought out of the Canadian Arctic and is expected to reach Vancouver about October 15th.

### Motorship Kennecott Safe

Rumors were rife that the motorship KENNECOTT had been lost as a result of disturbances connected with the great Japanese disaster at the end of August, but the vessel arrived safely in Kobe. "She was 140 miles off Yokohama"—states the Shipping Register—"at 8 P. M., August 31st, the day before the earthquake." She had left Puget Sound with a cargo of 4,000,000 ft. of lumber, as reported in the last issue of MOTORSHIP. For more than a week after the misfortune that was declared to have wiped out Yokohama, the KENNECOTT sent no news. Her cargo was the biggest lumber shipment ever carried to the Orient.

### Vancouver Tug Boat Czar

Greer & Christie's tug boat CZAR, of Vancouver, B. C., recently converted from steam to oil engine power by the installation of a 350 b.h.p. Bolinder engine, and operated in the name of the Czar Towing Co., was taken out on a trial trip last month, when about 50 shipping men were guests of the owners on a run up the harbor. There was no trial over a measured course, but the tug was estimated to be making about 10 knots, turning a propeller of 80 inches diameter and 50-inch pitch.

CZAR is 114 ft. o.a., by 22 ft. beam and 13 ft. draft. She was originally built at Victoria, B. C., and is of heavy wood construction with copper fastenings. This year she has been re-conditioned and her house-work re-built by the Pacific Construction Co., at Vancouver, where her new machinery was installed. The engine was built at Bolinders works, Stockholm, Sweden, and develops 350 b.h.p. It is a four-cylinder, two-cycle machine of surface ignition type with 16½ in. bore and 19 in. stroke. A 20 h.p. single cylinder Bolinder engine is direct connected to air compressor and generator. The deck machinery consists of electric towing winch and electric windlass. CZAR has a fuel capacity of 650 bbls. and will be used for log towing and other heavy work on the British Columbia coast.

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In the report of the Acting Governor of the Canal Zone to the Secretary of War, dated Balboa, August 25th, reference is made to the fact that 18 motorships aggregating only slightly less than 100,000 tons Canal net tonnage, passed through the Panama Canal during the month of July.

### Low Fuel Consumption On Motorships

The motorship EKNAREN, Swedish registry, owned and operated by the Transatlantic Steamship Co., transited the Canal July 30, en route from Antwerp to North Pacific ports. At the time of her transit of the Canal the fuel consumption of the EKNAREN was reported as 7½ tons daily at 10½ knots per hour.

The EKNAREN is a sister ship of the motorship YNGAREN, which is said to have been the first motor vessel to be equipped with opposed piston engines. The YNGAREN transited the Canal about a year ago, and at that time was reported to have established a world's low record for fuel consumption of 9 tons per day for a 9,000-ton carrier driven at an average speed of 10.57 knots. The motorship DOMINION MILLER, which transited the Canal recently, is another vessel operated with opposed piston engines, and the EKNAREN is said to embody improvements which were made possible by a study of these two predecessors.

The EKNAREN has a registered tonnage of 5,293 gross and 4,032 net. On her maiden voyage to the Pacific coast she carried 7,300 tons of cargo, consisting in part of 3,500 tons of silver sand, 1,245 tons of moulding sand, 1,500 tons of rags, and 300 tons of window glas.—*The Panama Canal Record.*

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Engineers will be interested in the description of the various types of Maihak indicators given in the latest bulletin of the Bacharach Industrial Instrument Company, of Pittsburgh. These are made in two styles for Diesel engines, one for use with engine speeds below 500 r.p.m. and the other for high pressure engines exceeding that speed. An attachment is made for use with the standard indicator to give the mean power developed over any period of time regardless of variation in load or method of governing. It integrates the area of every card while the engine is in operation. Copies of the bulletin may be had on application.

### To Stabilize American Shipbuilding

Charged with the investigation of general conditions as affecting shipyards and ship repair plants over the entire country, a committee headed by J. Harry Mull, President and General Manager of the Wm. Cramp & Sons Ship and Engine Building Company, last week established headquarters in the offices of the Atlantic Coast Shipbuilders' Association in Philadelphia, and began a study of the varied problems of the industry with the view of formulating recommendations that will insure a permanent future for American shipbuilding.

The findings of the committee will be acted upon at the forthcoming American Marine Congress to be held in New York City, November 5-10, when representatives of all groups interested in water transportation will meet to consider the nation's maritime problems in all of their various phases. The aim of the conference is to evolve a shipping program which will bring about a unity of purpose and coordination of effort throughout the industry, from the manufacturer who supplies the materials used in the construction of ships to the industrial groups whose products furnish the cargoes.

The cooperation of more than 200 American plants engaged in all branches of shipbuilding and marine repair work is sought in a communication which goes forward today from the Shipyards Committee pointing out the need for coordinated action and inviting the views of all shipyard executives as to subjects to be considered upon which definite recommendations can be formulated and placed before the American Marine Congress.

Associated with Mr. Mull on the Shipyards Committee are several of America's foremost shipbuilders, namely, John G. Pew, President, Sun Shipbuilding & Dry Dock Co., Chester, Pa.; H. G. Smith, Vice-President, Bethlehem Shipbuilding Corp., Bethlehem, Pa.; E. P. Morse, President, Morse Dry Dock & Repair Co., Brooklyn, N. Y., and J. J. Tynan, General Manager, Union Plant, Bethlehem Shipbuilding Corp., San Francisco, Cal. The secretary of the committee is Clarence Samuel King, who is also secretary of the Atlantic Coast Shipbuilders' Association, which has placed the facilities of its offices and staff at the disposal of the committee and is acting as a clearing house for the work now under way.

According to "Syren & Shipping" the Toyo Kisen Kabushiki Kaisha has ordered Diesel engines in Germany for installation in its triple screw turbine steamers TENYO MARU and SHINYO MARU. It is further stated that the company has appropriated one million (1,000,000) yen for the conversion of these two liners from steam to Diesel power.

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Applications for the positions of junior engineer and deck officer of the Coast & Geodetic Survey will be received by the U. S. Civil Service Commission at Washington until December 28th. Applicants will be required to pass an examination, and must have the degree of C. E. or B. Sc. before appointment. Salary starts at $2,000 a year. Officers of the Coast & Geodetic Survey receive a commission from the United States, the same as officers in the Army, Navy, Marine Corps and Public Health service.

### Manually Operated Foamite System

In an installation which Chas. Cory & Sons, Inc., have recently contracted to make on two vessels a departure is made from the usual Foamite system, inasmuch as these two vessels will have their Foamite hose pressure installations operated entirely by hand. Each vessel will be equipped with two 300 gal. solution tanks, from which separate pipes are laid to Foamite hose stations. The solutions are expelled from the tanks under nitrogen pressure, this gas being contained in two high-pressure cylinders connected by means of flexible couplings to a high pressure manifold. Gauges are provided on the high and low pressure sides of the manifold and on the solution tanks for visible indication of the contents, thereby ensuring inspection and maintenance of proper operating conditions. By means of an arrangement of valves, provision is made for flushing out the system with water and recharging it without manual labor after it has been used.

### Motorship for Messageries Maritimes

Early in October the expected order for a motor-liner will be placed in France by the Ste. des Services Contractuels des Messageries Maritimes, of Paris, for its Mediterranean service. Probably the Diesel engines will be built in another country. The vessel will be of 14,000 tons displacement and 13 knots speed, with accommodations for a total of 662 passengers, and a capacity of 3,600 tons of general cargo. The gross register will be 10,000 tons. Twin Diesel engines (make not yet decided) of 2,250 shaft h.p. each at 110 r.p.m. will be installed, and sufficient fuel carried for 4,900 nautical miles radius, as well as 700 tons of fresh water for the passengers and crew. The length of the vessel b.p. will be 423 ft. 2¾ in., by 58 ft. 0¾ in. moulded breadth, 35 ft. 9 in. moulded depth and 22 ft. 3¾ in. loaded draft. The passenger capacity consists of 109 first-class, 87 second-class, 82 third-class, and 484 fourth-class (emigrants) between decks.

Fuel-oil has been cut 15 cents per bbl. at Bayonne, N. J., by the Standard Oil Co.

### Interesting Case of Cracked Pistons

On her maiden voyage to India via the Suez Canal the British India Steam Navigation Co.'s Stephen-Sulzer motorship DALGOMA, had the unfortunate experience of four cracked pistons. The circumstances are so interesting and instructive that a description of the causes and the conclusions drawn from the occurrence must be of value to the owners of other Diesel engine driven vessels.

As far as Alexandria the DALGOMA had a most successful voyage, but when passing through the Canal, where a speed of about 5 knots is required for six hours on end, the trouble referred to above occurred. To obtain the slow speed on the DALGOMA, her twin four-cylinder engines had to be run at about 30 r.p.m. It is possible to run these engines as low as 25 r.p.m. with all cylinders working, but for smooth running two cylinders in this case on each engine were cut out. The well known piston water-cooling system of the Sulzer engine is such that only a small quantity of water is contained in the piston while the engine is running, and the lower the piston speed the less water there is in the piston, cooling being dependent then upon the jet from the telescopic tube.

At speeds over 40 r.p.m. on this size of engine, the water contained in the piston is in a state of turbulence, and thereby aids the jet in obtaining the necessary cooling of the crown of the piston.

The working conditions at the time of the incident described were such that the crown of the pistons in the two cylinders that were firing on each engine became overheated, and when the six hours slow speed running came to an end the increase of speed of the engine was sufficient to throw the water in the pistons against the crown, thereby causing sudden cooling stresses. The result was a small crack in the center of each piston, immediately below the fuel inlet valve. The mishap was detected by the engineer on watch noticing exhaust gas coming from the piston cooling outlet.

In future, the possibility of this trouble occurring will be avoided by running always on four cylinders, even for the lowest speeds which are likely to be required, and by ensuring that the cooling effect when running at these low speeds will be maintained, even if it is necessary to run with two cylinders only.

It may be remarked that experiments have been carrid out since the above accident, and it has been found from these experiments and from the reports from the ship that the conditions which brought about the overheating are peculiar to a prolonged running at 40 r.p.m. or less, and that never at any higher speeds can there be any overheating of the piston crowns.

The actual time required for fitting four new pistons was two days, which is a remarkable testimony to the simplicity of the Sulzer engine.

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# *Nuolja* Launched and *Oxelösund* Makes Trials

## *Götaverken Launch a Diesel-Driven Ore-Carrier and Run Trials of Another*

By THE EDITOR

DUAL events with motor-driven ships at Götaverken are now regularly carried out as standard practice. Of course, they can only take place when a yard has a considerable amount of work on hand. Since the Götaverken abandoned steamship construction and devoted their large shipyard and works exclusively to motorship building and Diesel engine construction they have been very busy, even through this long slump in the world's shipbuilding business.

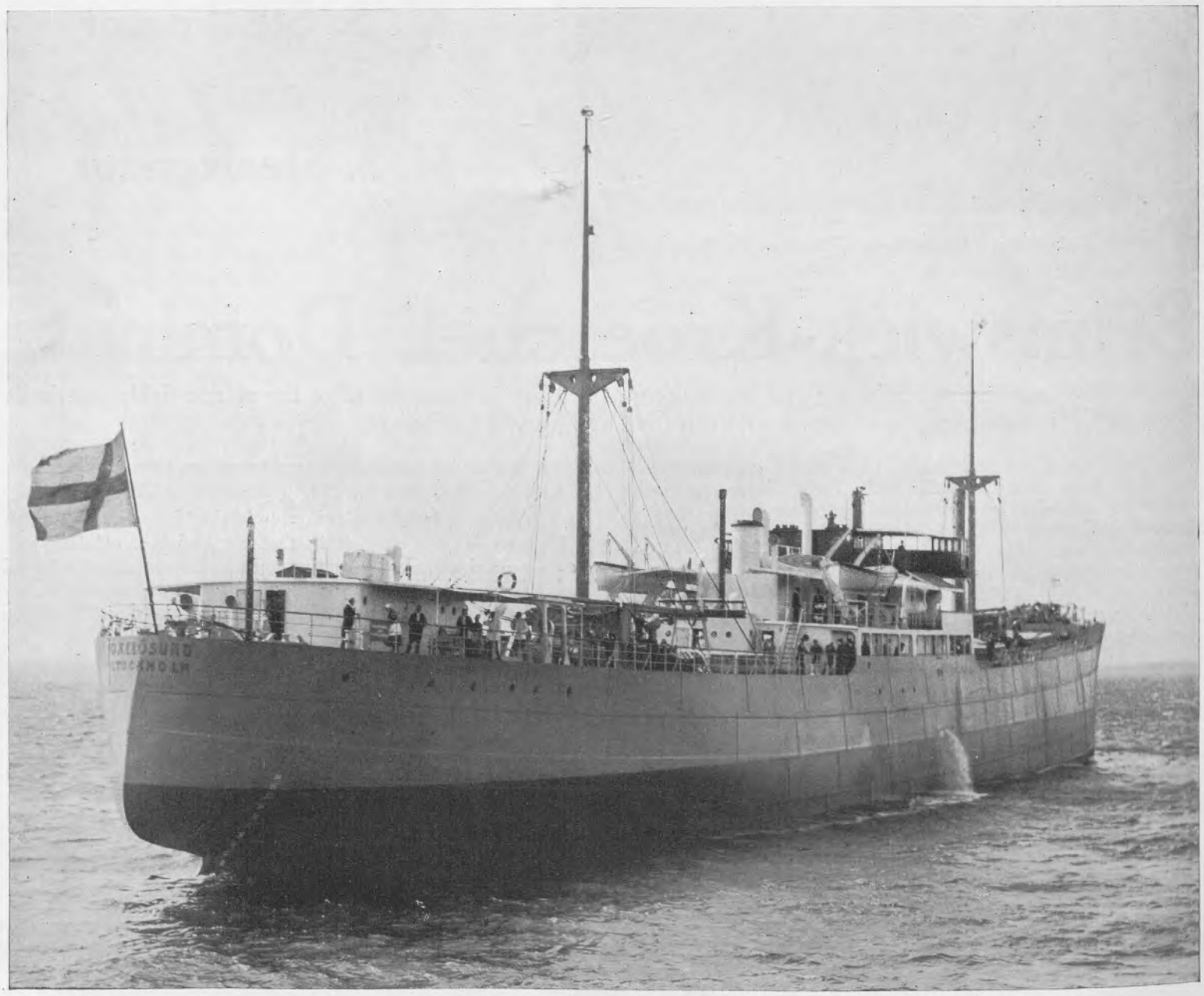
No steamship builders can say this today, which indicates the present trend of shipping. In fact, at Gothenburg there are two other shipyards which, although they have recently acquired Diesel engine licenses, have not actually started construction work, and the ways of both these plants are devoid of keels. How strangely is their case contrasted with the Götaverken yard, where in addition to the vessel launched and the vessel on trial on the day of my visit, there are six motorships of 3,000 tons to 9,000 tons deadweight each on which work has actually commenced. This includes two motorships for American owners.

During my visit the first event of the day was the launching of the NUOLJA, an ore-carrying vessel of 9,500 tons d.w.c., completed to the order of the Trafikaktiebolaget Grängesberg-Oxelösund, of Stockholm, and in which two Götaverken-B. & W. Diesel engines of 1,350 i.h.p. each have been installed. The christening ceremony was performed by Mrs. Melin, wife of Director K. W. Melin of the owning company, and the vessel glided gracefully down the ways without a hitch immediately the champagne struck her prow.

The guests then made their way to a small steamer, and were taken outside the harbor where the new ore carrying motorship OXELÖSUND, which had been running her trials that morning, was waiting. She averaged a speed of 11¾ knots on a fuel consumption of 0.303 lb. per i.h.p. hour with her main engines developing 2,820 i.h.p.

Then the OXELÖSUND proceeded for a trip under power while luncheon was served to over 200 guests, amongst whom were: Dr. Emanuel Nobel, exiled head of the one-time great Russian oil company; Einar Wohlin, Minister of Commerce and Industry in Sweden; Admiral H. P. Lindberg, Chief of the Swedish Navy Administration; Kommendör J. C. Schneidler, of the Swedish Navy's Shipyard Division; O. Rydbeck, a well-known bank director and member of the Board of Trafik A. B. Grängesberg-Oxelösund; K. W. Melin, managing-director of the Grängesbergsbolaget; and Kommendör Hans Ericsson of the Sveabolaget, which is the largest coastwise steamship service in Sweden.

We also had the pleasure of meeting on board Consul-General Axel Johnson, Managing Director of the Nordstjärnan Line who, it will be remembered, gave a lunch to American shipowners about a year ago on board his motorship BUENOS AIRES in New York harbor. Other important men on board included Dan Brostrom, head of the Scandinavian-American Line, who recently ordered a Transatlantic motorliner with Burmeister & Wain double-acting Diesel engines; Sir Westcott Abell, of



Latest motorship of the Trafik A. B. Grängesberg-Oxelösund, the trials of which were attended by the Editor of MOTORSHIP

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Lloyds Register; Hugo Hammar and Ernst Heden, Directors of the Götaverken; Captain C. F. Olsen of the U. S. Shipping Board; Dr. N. Matsunami, Professor at Tokio University and Professor at the Higher Naval Staff College; T. Matsura, Secretary of the Ministry of Communication, Tokio; N. Ohtani, Manager of the Nippon Yusen Kaisha and representative of the Japan Shipowners' Association, London; and K. Okada, Secretary at the Japanese Legation, Stockholm.

The dimensions of the NUOLJA are as follow:

| | |
|---|---|
| Loaded displacement | 13,200 tons |
| Light | 3,700 tons |
| Deadweight capacity | 9,500 tons |
| Cruising radius | 25,000 miles |
| Designed speed of ship | 11 knots |
| Length overall | 421 ft. 0 in. |
| Length between perps | 405 ft. 0 in. |
| Breadth, moulded | 56 ft. 0 in. |
| Depth, moulded, to main deck | 29 ft. 0 in. |
| Loaded draft, mean | 27 ft. 1 in. |
| Power | 2,700 i.h.p. |
| Engine speed | 130 r.p.m. |

The OXELÖSUND has the following dimensions:

| | |
|---|---|
| Loaded displacement | 11,750 tons |
| Light displacement | 3,400 tons |
| Deadweight capacity | 8,350 tons |
| Capacity of fuel tanks | 2,227 tons |
| Cruising radius | 25,000 miles |
| Length overall | 399 ft. 3 in. |
| Length between perps | 385 ft. 0 in. |
| Breadth, moulded | 53 ft. 5 in. |
| Depth, moulded, to main deck | 26 ft. 0¾ in. |

M. S. *Nuolja* just off the ways

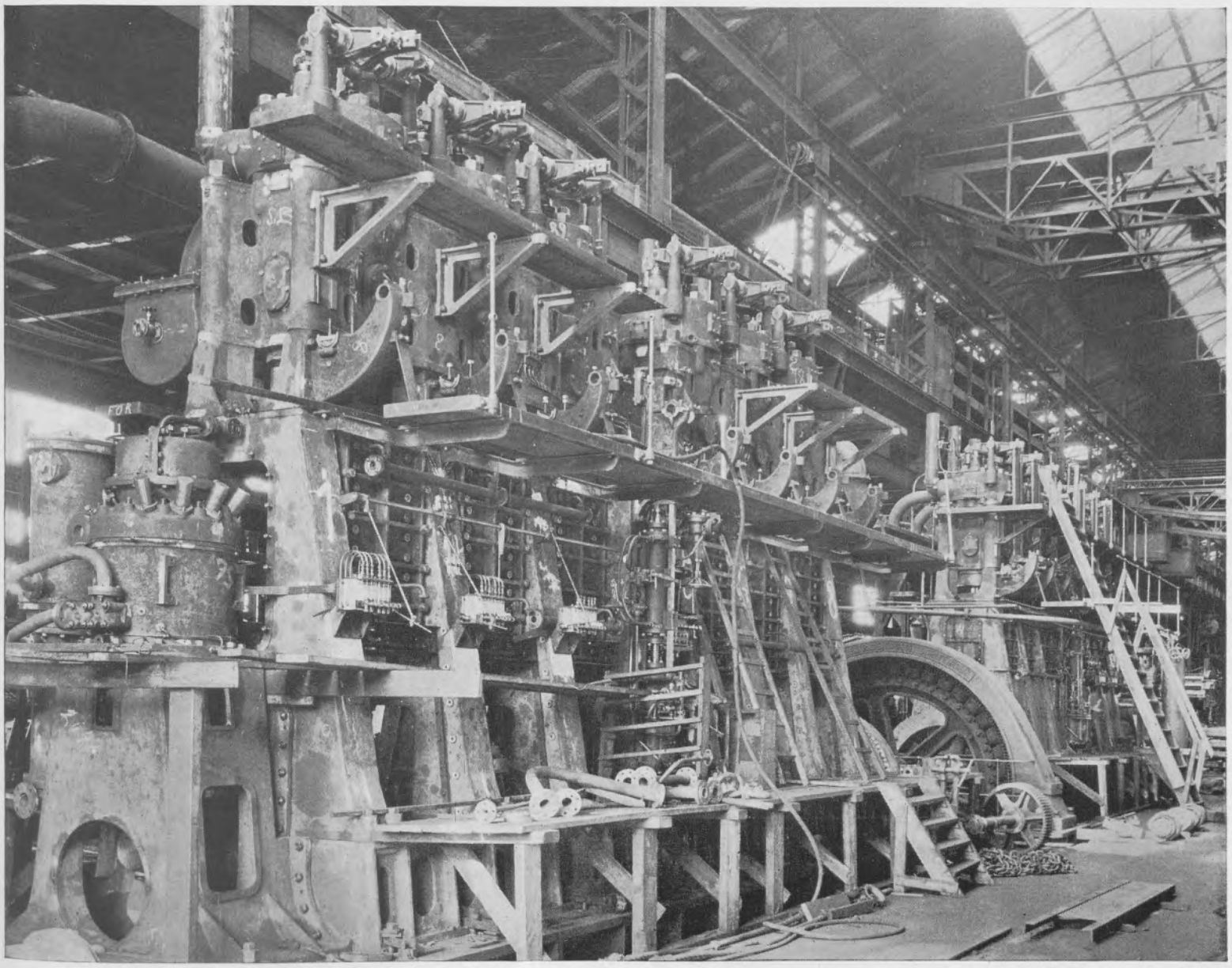
| | |
|---|---|
| Summer draft | 25 ft. 3⅛ in. |
| Power | 2,700 i.h.p. |
| Number of cylinders | 6 per set |
| Cylinder diameter | 35½ in. |
| Piston stroke | 59½ in. |

The deck officers' and engineers' quarters are placed in the deck-house amidships, also messroom and galley; the crews' are located under shelter-deck aft. The vessel is provided with wireless telegraph.

In addition to the bunker capacity for 550 tons of fuel-oil, there are deep-tanks for 1,650 tons of oil, which can be carried as cargo from oversea ports to Sweden, and so add considerably to the vessel's normal earning power.

For driving the electric generators three 75 b.h.p. Götaverken Diesel engines are installed, direct connected to 50 k.w. 220 volt d.c. generators, turning at 325 r.p.m.

The electrically driven auxiliaries comprise: two circulating pumps to draw from the sea on each side of the ship and discharge to the main engines and auxiliary circulating lines; one ballast plunger-pump with a capacity of 100 tons per hour, arranged to draw from the sea, bilges and double bottom, and discharge to the double-bottom tanks and over board, a separate discharging line for pumping oil to tanks on shore being connected to the pump; one ballast-pump of the centrifugal type of 300 tons per hour arranged to draw from the sea and deep-tanks and to discharge to the deep-tanks and over board; two sets of combined bilge-and-sanitary pumps; two lubricating-oil pumps to draw from the lubricating-oil drain-tanks and discharge through the lubricating-oil coolers to the main and auxiliary engines; one air-compressor coupled to a 90 h.p. electric motor



Twin-screw engines for the M. S. *Nuolja* in the Götaverken erecting shop, where Diesel engin es follow one another in quick succession

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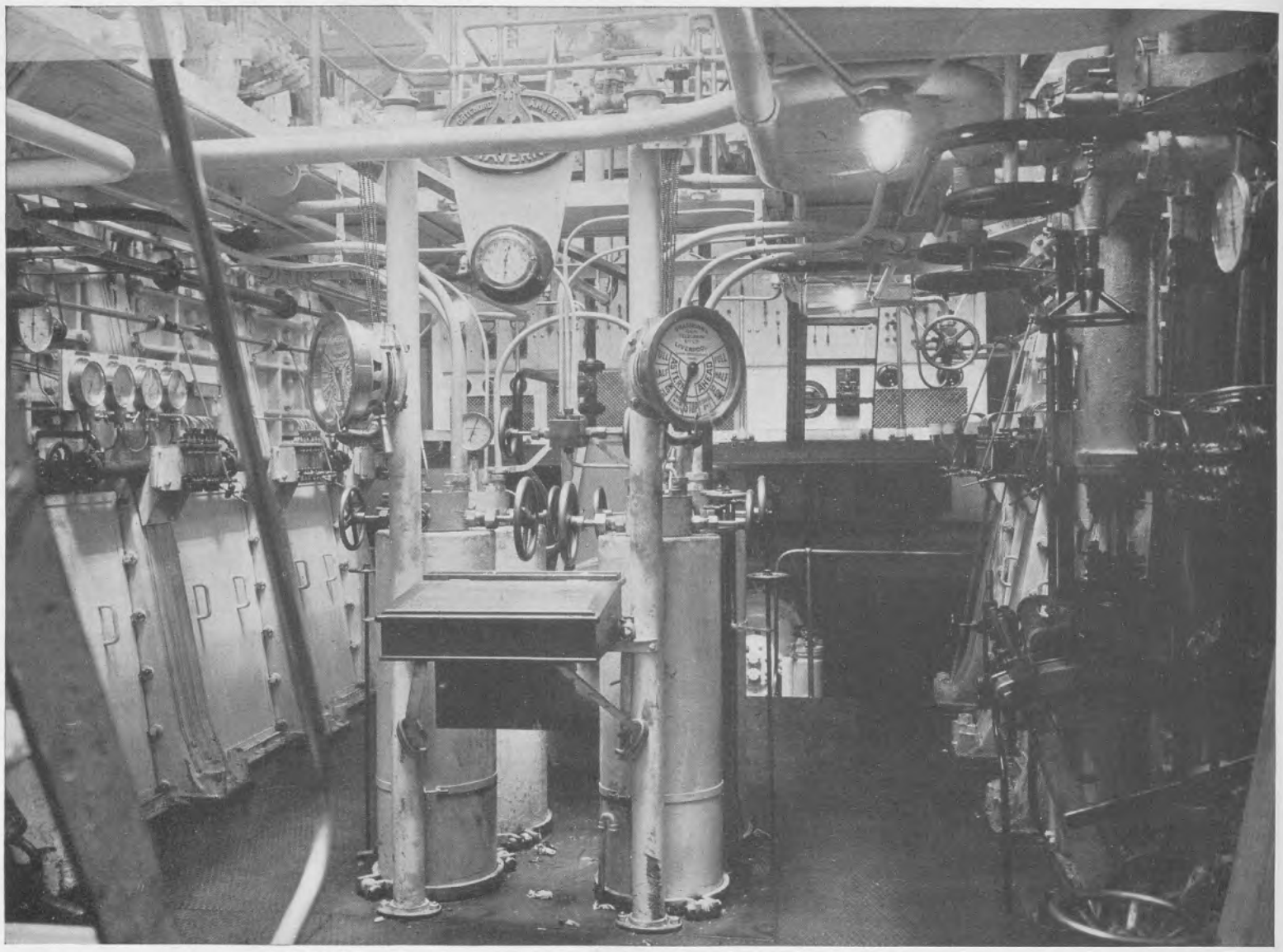

Engineer's platform in the engine-room of the M. S. *Oxelösund*, the trial trip of which is referred to on the previous pages

to supply the starting-air receivers at 350 lbs. per sq. in.; one 15 h.p. toothed-wheel pump for fuel-oil service, arranged to draw from the engine-room double-bottom and after-cofferdam and discharge to the daily fuel-supply tanks and over board.

In addition there is a steam-driven auxiliary air-compressor for emergency purposes, to deliver the full pressure at 850 lbs. per sq. in. to the injection air flasks of the auxiliary engines. A cross-tube boiler, with 100 sq. ft. heating area and designed for oil burning, is fitted aft in the engine-room. It will supply steam to the heating apparatus, auxiliary air-compressor, distiller, boiler, feed-water pump, injector and oil-burning apparatus. In accordance with Götaverken practice this is the only steam power on board the ship.

It will be of interest to add a few remarks regarding the Götaverken, where these two motorships were built and engined. The yard is the largest in Sweden and was established in 1841 in the central part of the harbor, directly opposite the heart of the city and the big steamship companies' offices. The plant has five berths, and altogether with machine-shops and offices covers 40 acres and employs 3,000 men. On four of the berths, ocean-going motorships up to 20,000 tons d.w. can be laid down, though the average size of the ships turned out is close to 9,000 tons d.w.

Up to the present time 17 motorships have been completed at this yard, and all, with the exception of the HAMLET, have Götaverken-B. & W. Diesel engines installed. These ships are as follows:

| | | |
|---|---|---|
| M/S HAMLET ..... | 7,500 tons d.w. | 3,800 i.h.p. |
| BULLAREN ..... | 9,400 | 4,000 |
| TISNAREN ..... | 9,400 | 4,000 |
| BALBOA ..... | 9,300 | 3,100 |
| STUREHOLM .... | 7,800 | 2,800 |
| BUENOS-AYRES .. | 9,300 | 3,100 |
| ELMAREN ..... | 9,400 | 4,000 |
| CANADA ..... | 9,300 | 3,100 |
| FRITIOF, Motor Salvage Ship.. .... | | 1,350 |
| STRASSA ..... | 8,300 | 2,800 |
| HEMLAND ..... | 8,100 | 2,800 |
| LAPONIA ..... | 8,300 | 2,800 |
| OLJAREN ..... | 7,500 | 2,800 |
| LULEA ..... | 8,300 | 2,800 |
| LUOSSA ..... | 8,300 | 2,800 |
| KOLSNAREN ..... | .... | .... |
| OXELOSUND ..... | 8,300 | 2,700 |
| NUOLJA ..... | 9,500 | 2,700 |

Vessels built at other shipyards fitted with Götaverken motors have been:

| | | |
|---|---|---|
| SULINA ..... | 4,540 tons d.w. | 1,600 i.h.p. |
| CANTON .....10,560 | | 4,000 |
| ERLAND ..... | 3,100 | 1,600 |

At the present time the following motorships are under construction, and in addition the Götaverken are building a 1,600 h.p. B. & W. type Diesel engine for a Norwegian ship that is building elsewhere.

| Yard No. | Tons D.W. | Power |
|---|---|---|
| 361 | 9,500 | 2 x 1,350 i.h.p. |
| 362 | 9,500 | 2 x 1,350 i.h.p. |
| 372 | 9,500 | 2 x 2,000 i.h.p. |
| 376 | 3,000 | 2 x 1,350 i.h.p. |
| 377 | 3,000 | 2 x 1,350 i.h.p. |
| 384 | 5,000 | 1 x 2,000 i.h.p. |

The first two are for account of the Trafik A. B. Grängesberg-Oxelösund, the next two for the A. B. Svenska Ostasiatiska Kompaniet, the third couple for the Pacific Mail S.S. Co., of San Francisco, and the last vessel for Nobel interests.

There are no steamships on order at this plant, a fact which should offer plenty of food for thought to those shipbuilders who have not actively taken up motorship construction, and who are now complaining about the bad times being met in the industry.

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A 6,000 b.h.p. submarine Diesel engine of the Chaléassière type is now being built at the works of the Etablissements Leflaive, near St. Etienne, France. This firm recently completed a 3,000 b.h.p. engine for submarine service.

Two engines of 2,900 s.h.p. in four cylinders are being built at Doxford's in England for single-screw ships of 10,000 tons d.w. The same firm is also building three engines of 1,850 s.h.p. in three cylinders for 8,000 ton ships.

Rechristened at her launching, the latest motorship built at the Deutsche Werft, Hamburg, for W. Wilhelmsen, of Tonsberg, will be known as the TORTUGAS instead of TAMPICO as originally planned and used in South American trade.

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